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PREFACE.

SINCE 1880, when Mr. Holmes requested me to re-edit Sir G. M. Humphry's article on the "Diseases of the Male Organs of Generation" for the third edition of the *System of Surgery*, my attention has been drawn to these subjects. It will be seen that in one point the title of my book is not correct; the necessary limits of space have prevented my entering into many details connected with the Prostate which might have been included in a completer attempt than this.

Messrs. Churchill have allowed me to make use of the illustrations in Mr. Curling's work, and also some of those in Mr. S. Osborn's books on Hydrocele and Diseases of the Testicle. To Messrs. Longman I am indebted for permission to introduce three illustrations from vol. iii. of the *System of Surgery*.

My best thanks are due to two old dressers—G. Bellingham Smith, F.R.C.S., for much help in hunting up references, and A. E. Norburn, M.B., for the care with which he has corrected the proof-sheets, and for the painstaking labour involved in compiling each Index. Finally, without the help of my brother, C. L. Jacobson, I could not have found the time needed for consulting many of the German writers referred to.

W. H. A. JACOBSON.

66 GREAT CUMBERLAND PLACE, W.

CONTENTS.

PART I.

DISEASES OF THE TESTICLE.

CHAP. PAGE

I. DEVELOPMENT AND TRANSIT OF THE TESTICLE.—1. How is the transit of the testicle brought about?—2. Why does this transit from the abdomen to the scrotum take place?—3. Pathological conditions which may follow on deficiencies or errors in the development and transit of the testicle 1–20

II. CONGENITAL ABNORMALITIES AND DEFECTS OF THE TESTICLE AND ITS ANNEXA.—Section I. ABNORMALITIES IN DEVELOPMENT.—Polyorchism.—Anorchism.—Monorchism.—Chief deficiences in the seminal apparatus: (1) Absence of the testicle only; (2) Absence of the testicle, the epididymis, and a portion, more or less extensive, of the vas deferens; (3) Absence of the whole apparatus; (4) Absence of all, or part of, the excretory apparatus, the testicle being present; (5) Bilateral anorchism.—Section II. ABNORMALITIES IN THE TRANSIT OF THE TESTICLE.—(A.) Incomplete transit or retention of the testicle.—Varieties. (B.)—Malplaced transit or ectopia testis.—Varieties.—Causes of abnormalities in the transit of the testicle.—Question of the functional efficacy of a retained or ectopic testicle.—Complications of a retained or ectopic testicle.—Treatment of the complications.—Orchidopexy.—Section III. ABNORMAL POSITION OF THE TESTICLE IN THE SCROTUM.—Inversion of the testicle.—Varieties.—Reversion of the testicle 21–96

III. HYDROCELE.—Section I. ACUTE HYDROCELE.—Classification of hydrocele.—Section II. HYDROCELE OF THE TUNICA VAGINALIS, COMMON OR VAGINAL HYDROCELE.—Causes.—Characters of the fluid.—Changes in the tunica vaginalis.—Condition of the testicle and epididymis.—Symptoms.—Diagnosis.—Complications.—Accidents.—Treatment: (A) Palliative.—Tapping.

CHAP. PAGE

Accidents.—Acupuncture ; (B) Radical cure.—(i.) Introduction of stimulating substances.—(ii.) Iodine.—Complications.—(iii.) Carbolic acid.—Complications.—(iv.) Silver nitrate.—Antiseptic incision.—Antiseptic incision with partial excision of the sac.—Choice of operation.—Seton and other methods.—Section III. CONGENITAL HYDROCELE.—Source of the fluid.—Symptoms.—Diagnosis.—Complications.—Treatment.—Section IV. INFANTILE HYDROCELE.—Symptoms.—Diagnosis.—Treatment.—Section V. BILOCULAR HYDROCELE. HYDROCELE EN BISSAC. INFANTILE HYDROCELE WITH PROLONGATION INTO THE ABDOMEN.—Symptoms.—Treatment.—Section VI. FATTY, CHYLOUS, MILKY HYDROCELE. — Causation. — Theories. — Symptoms.—Treatment.—Section VII. ENCYSTED HYDROCELE OF THE TESTICLE.—Varieties: (i.) Encysted hydrocele of the epididymis.—Pathology.—(A) Small cysts.—(B) Large cysts, often containing spermatozoa. — Pathology. — Explanations ; (ii) Encysted hydrocele, situated between the tunica albuginea and the tunica vaginalis, or in the tunica albuginea itself.—Symptoms of encysted hydrocele. — Diagnosis. — Treatment. — Section VIII. HYDROCELE OF A HERNIAL SAC.—Symptoms.—Diagnosis.—Treatment.—Section IX. FIBROUS OR SO-CALLED CARTILAGINOUS BODIES, ATTACHED OR FREE, IN THE CAVITY OF THE TUNICA VAGINALIS.—Varieties.—Origin.—Symptoms.—Treatment 97–214

IV. HÆMATOCELE.—Varieties.—Section I. HÆMATOCELE OF THE TUNICA VAGINALIS.—Question of spontaneous origin.—Question of origin in injury, or in a pathological condition of the tunica vaginalis.—Interior of vaginal hæmatoceles.—Contents.—Site and condition of testicle.—Causes.—Symptoms.—Complications.—Diagnosis.—Treatment: (A) Palliative ; (B) Radical.—Incision.—Incision and scraping.— Decortication.—Castration.—Section II. ENCYSTED HÆMATOCELE OF THE TESTICLE.—Diagnosis.—Treatment.—Section III. PARENCHYMATOUS OR INTRA-TESTICULAR HÆMATOCELE.—Section IV. HÆMATOCELE IN THE SUBSTANCE OF THE EPIDIDYMIS.—Section V. COMBINED ABDOMINAL AND SCROTAL HÆMATOCELE. BILOCULAR HÆMATOCELE 215–247

V. INFLAMMATORY AFFECTIONS OF THE TESTICLE AND EPIDIDYMIS.—Section I. EPIDIDYMITIS.—Section II. EPIDIDYMITIS OR EPIDIDYMO-ORCHITIS OF URETHRAL ORIGIN.—Causes.—Pathological anatomy. — Symptoms. — Varieties. — Complications.—Termination.—Abscess in the testicle.—Treatment of acute and sub-acute epididymo-orchitis.—INFLAMMATION OF THE TESTICLE AND ITS IMMEDIATE SURROUNDINGS DUE TO GENERAL

CHAP. PAGE

DISEASES, OFTEN INFECTIOUS. — Mumps. —Nature of the orchitis.—Typhoid fever. — Nature. — Scarlet fever. —Orchitis complicating influenza. —Inflammation of the testicle and its immediate surroundings in malaria and ague.—Gouty orchitis. —Gouty orchitis proper. —Gouty epididymo-orchitis. —Rheumatic orchitis. — Orchitis and acute tonsillitis. — Epididymo-orchitis from strain. —Section III. ORCHITIS PROPER.—Causes. — Sequelæ. — Treatment. — SYPHILITIC AFFECTIONS OF THE TESTICLE AND EPIDIDYMIS: (A) Acquired. — 1. SYPHILITIC ORCHITIS, SYPHILITIC SARCOCELE. — Two forms. — (α) Diffuse interstitial orchitis.—Pathology.—(β) Gummatous orchitis.—Pathology.—Condition of the tunics and annexa of the testicle.—Terminations.—2. SYPHILITIC EPIDIDYMITIS. (B) ORCHITIS DUE TO HEREDITARY SYPHILIS.—Clinical course of syphilitic orchitis.—Prognosis.—Treatment 248-320

VI. TUBERCULAR DISEASE OF THE TESTIS AND ITS APPENDAGES.—Ways in which the testicle and its appendages become the seat of tubercle.—Mode of entrance of the bacilli.—By the blood-vessels.—Question of infection during coitus.—Predisposing conditions: i. Hereditary taint; ii. Injury; iii. Mixed infection; iv. Venereal excitement; Morbid anatomy: (1) Naked-eye changes.—A. Epididymis.—B. Testis.—C. Tunica vaginalis.—D. Vas deferens.—E. Vesiculæ seminales.—F. Prostate; (2) Microscopical appearances.—Acute tubercular disease of epididymis and testis.—Symptoms: A. Of the more chronic form; B. Of the acute. — Diagnosis. — Course. — Prognosis. — Complications.—Treatment: (A) Medical or palliative; (B) Operative: (1) Opening and scraping out abscesses; (2) Use of the cautery; (3) Castration.—Tuberculosis of the testicle in infants 321-375

VII. FUNGUS OR HERNIA TESTIS.—Varieties: (i.) In tubercular disease; (ii.) In syphilitic disease; (iii.) In malignant disease . 376-383

VIII. NEW GROWTHS OF THE TESTIS, EPIDIDYMIS, AND TUNICA VAGINALIS.—Classification: Section I. CARCINOMA.—(α) Encephaloid.—Starting-point.—Naked-eye appearance.—Generalisation. Microscopical appearances. — (β) Scirrhus. — Sub-varieties of encephaloid.—Section II. SARCOMA.—Starting-point.—Naked-eye appearance.—Generalisation. — Microscopic appearance.—Sub-varieties.—Clinical history of Carcinoma.—Sarcoma.—Diagnosis.—Prognosis.—Treatment.—LYMPHADENOMA.—ENCHONDROMA: A. Uncombined; B. Mixed.—FIBROMA.—MYXOMA. —MYOMA.—OSTEOMA.—CYSTIC DISEASE.—Two groups: A. More innocent; B. More complicated and malignant.—Naked-eye and minute anatomy.—Starting-point.—Course.—Prognosis.

CHAP. PAGE

—TERATOMATA.—Varieties: A. More complicated one.—Fœtal inclusion; B. Simpler form of dermoid cysts.—Clinical history. Prognosis.—Treatment 384–432

IX. GROWTHS OF THE TUNICA VAGINALIS.—LIPOMA.—FIBROMA.—SARCOMA.—CASTRATION 433–442

X. LESIONS OF NUTRITION.—HYPERTROPHY.—ATROPHY.—Two conditions: (i.) Atrophy proper; (ii.) Arrest of development . 443–451

XI. IRRITABLE AND NEURALGIC TESTICLE 452–456

XII. MASTURBATION.—SO-CALLED SPERMATORRHŒA.—SEMINAL EMISSIONS.—SEXUAL HYPOCHONDRIASIS.—CONTINENCE AND SEXUAL HYGIENE 457–477

XIII. IMPOTENCE.—STERILITY.—Physiological facts and practical results.—A. IMPOTENCE.—Varieties: (i.) Atonic; (ii.) Physical; (iii.) Symptomatic; (iv.) Organic.—STERILITY.—Varieties: (i.) Azoospermia; (ii.) Aspermia; (iii.) Male-mission . 478–498

PART II.

DISEASES OF THE CORD.

I. INFLAMMATORY AFFECTIONS.—Acute and chronic.—HYDROCELE: (i.) Acute; (ii.) Diffuse or infiltrated; (iii.) Encysted 498–507

II. HÆMATOCELE OF THE CORD.—Diffuse.—Encysted . . . 508–512

III. NEW GROWTHS.—LIPOMATA.—MYXO-LIPOMATA.—FIBROMATA.—MYXOMATA.—MYXO-SARCOMATA.—SARCOMATA.—MYOMATA. 513–519

IV. VARICOCELE.—Pathological anatomy.—Causation.—Symptoms.—Complications.—Condition of testicle.—Treatment: (A) Palliative, (B) Operative.—Antiseptic excision.—Risks and causes of failure 520–543

PART III.

DISEASES OF THE SCROTUM.

CHAP. PAGE

I. INFLAMMATORY AFFECTIONS OF THE SCROTUM. — Section I. CHRONIC ŒDEMA OF THE SCROTUM.—Section II. INFLAMMATORY ŒDEMA. — DIFFUSE INFLAMMATION. — CELLULITIS.— ERYSIPELAS.—GANGRENE.—Anatomical conditions predisposing to the above.—Causes.—Treatment.—Section III. SCROTAL OR EXTRA-VAGINAL HÆMATOCELE 544-551

II. NEW GROWTHS OF THE SCROTUM.—Section I. MALIGNANT DISEASE.—Epithelioma.—Initial form. — Progress.—Extension to the lymphatic glands.—Question of diminishing frequency of this disease in England.—Question whether this disease is almost unknown out of England.— Treatment.—Section II. MELANOTIC GROWTHS OF THE SCROTUM.—Paget's disease . 552-564

III. NON-MALIGNANT NEW GROWTHS OF THE SCROTUM.—Angeiomata. — Sebaceous cysts. — Other forms of cystic disease.— Hydatid cysts.—Urinary cysts.—Fibromata.—Fibro-myxomata. Sarcomata.—Chondromata.—Osteomata.—Lipomata . . . 565-575

IV. SCROTAL ELEPHANTIASIS.—Causes of endemic and other varieties. — Symptoms.— Treatment.— Lymph-scrotum.— Affinities. —Treatment 576-588

V. SCROTAL FISTULÆ AND SCROTAL CALCULI 589-590

PART IV.

DISEASES OF THE VESICULÆ SEMINALES.

I. ANOMALIES.—ATROPHY 591-592

II. INFLAMMATORY AFFECTIONS.—Causes.—Symptoms.—Treatment 593-600

III. DILATATION AND CYSTS 601-602

IV. CONCRETIONS 603-604

V. TUBERCULAR DISEASE 605-607

VI. NEW GROWTHS 608

PART V.

DISEASES OF THE PENIS.

DIVISION I.—ABNORMALITIES IN DEVELOPMENT.

CHAP. PAGE

I. ABSENCE.—APPARENT ABSENCE 609–611

II. TORSION 612

III. CONGENITAL ADHESION TO SCROTUM 613–614

IV. DOUBLE PENIS 615–616

V. CONGENITAL FISTULA 617–618

VI. ABNORMALITIES IN SHAPE AND SIZE 620

DIVISION II.—ANOMALIES AND DISEASES OF THE PREPUCE.

I. PHIMOSIS.—Development of the prepuce.—Symptoms.—Sequelæ. Circumcision.—Sequelæ.—Acquired Phimosis.—Paraphimosis. —Complications.—Treatment.—Section II. DEFICIENT DEVELOPMENT OF THE PREPUCE.—Congenital absence.—Congenital Division.—Shortness of the frænum 621–645

II. Section I. DILATATION OF THE PREPUCE.—Section II. PREPUTIAL CALCULI 646–649

III. INFLAMMATORY AFFECTIONS OF THE PENIS.—Section I. CHRONIC ŒDEMA.—Section II. BALANITIS.—BALANO-POSTHITIS. — Varieties : Venereal, Gouty, Catarrhal, Croupous, Diphtheritic, Diabetic.—Section III. HERPES PROGENITALIS, or PREPUTIALIS.—Section IV. CUTANEOUS DISEASES OF THE PENIS.—Lupus.—Eczema 650–666

IV. ACUTE INFLAMMATORY AFFECTIONS.—CELLULITIS.—ERYSIPELAS.—LYMPHANGITIS 667–669

V. INFLAMMATION OF THE ERECTILE TISSUES OF THE PENIS.—CAVERNITIS.—PENITIS.—GANGRENE.—Section I. CAVERNITIS.—PENITIS.—Section II. GANGRENE.—Causes, General and Local.—Symptoms.—Treatment 670–677

VI. Section I. CHRONIC INDURATION OF THE ERECTILE TISSUES OF THE PENIS.—Section II. FORMATION OF CARTILAGE AND BONE IN THE PENIS 678–683

VII. ACUTE GOUTY AFFECTION OF THE PENIS 684–685

VIII. NEURALGIA OF THE PENIS 686–687

IX. GUMMATA OF THE PENIS 688–689

CHAP. PAGE.
X. TUBERCULOSIS OF THE PENIS 690-691

XI. DISEASES OF THE VESSELS.—Section I. AFFECTIONS OF THE BLOOD-VESSELS.—Nævi.—Varicose veins.—Section II. PRIAPISM.—Causes.—Relation to leukæmia.—Symptoms.—Treatment.—Section III. DILATATION OF THE LYMPHATIC VESSELS 692-699

DIVISION III.—NEW GROWTHS OF THE PENIS.

I. ELEPHANTIASIS . . . .
II. INNOCENT NEW GROWTHS.—Section I. SEBACEOUS CYSTS.—Section II. ANGEIOMATA.—Section III. HORNS.—Section IV. PAPILLOMATA 700-706

III. MALIGNANT DISEASES.—Section I. EPITHELIOMA.—Modes of commencement.—Course.—Extension to lymphatics.—Visceral metastasis.—Causes.—Symptoms.—Diagnosis.—The precancerous stage.—Treatment: i. Amputation.—(A) Flap method.—(B) Circular method.—Removal by the cautery.—Objections.—Question of castration after amputation of the penis; ii. Extirpation of the penis; iii. Removal of inguinal glands.—Section II. GROWTHS OF THE ERECTILE TISSUES OF THE PENIS: i. Primary sarcoma; Melanotic sarcoma; ii. Secondary or metastatic sarcoma; iii. Secondary or metastatic carcinoma . 707-745

PART I.

DISEASES OF THE TESTICLE.

CHAPTER I.

DEVELOPMENT AND TRANSIT OF THE TESTICLE.

As many points of much practical importance in the diseases of the testicle and its annexa are only to be explained by reference to its development and transit,* a short account of the above will first be given. And here two questions call for some attempt at an answer—i. **How is the transit of the testicle brought about?** ii. **Why does this transit from the abdomen to the scrotum take place?**

Without going into needless details a short sketch of the transit of the testis † will be given here, those points especially being alluded to in which the early history of the testis bears upon its diseases later on.

The testis, like the ovary, is developed from a mass of fœtal tissue, **the genital or sexual eminence,** which appears on the front and inner part of the Wolffian body. The growth of this eminence is so rapid that by the seventh week it has equalled in bulk, and by the tenth become larger than the Wolffian body itself. As the sexual eminence develops the Wolffian body withers, and is converted into the epididymis. Before the transition of the testicle both this body, which is developing, and the Wolffian body, which is withering, lie in relation with the lower and outer part of the permanent kidney, which is developed behind and independently of the Wolffian body. It is very important to remember that before the testicle starts in its transit these organs are already so low down in the abdomen that the distance of the testis from the external abdominal ring is exceedingly small (Lockwood, *supra cit.*). **Important changes** now take place **affecting the mobility of the testis.** By the fourteenth day in the rabbit, and by the sixth week in the human embryo, the Wolffian body has a well-marked mesentery attached to the dorsal wall of the abdomen, and there is, as well, an obvious constriction between the Wolffian body and the genital eminence. This mesentery, ultimately the mesorchium or mesovarium, becomes increasingly distinct, and the genital mass is commonly fastened to it by a narrow neck.

---

* As, with the ordinary position of the fœtus in utero, the passage of the testicle out of the abdomen is contrary to gravitation, I have followed Mr. Curling in not employing the usual term "descent."

† The difficulties which beset the elucidation of this subject—viz., (*a*) the insufficiency of the supply of specimens, especially in regular sequence at early dates; (*b*) the difficulty of clearing up important points in specimens necessarily so minute and with tissues so delicate; (*c*) the fact that many of the specimens procurable are too decomposed and damaged to admit of examination—are well known. Mr. Lockwood (*Hunt. Lect.*, 1887) investigated this subject by means of sections, both longitudinal and transverse, of embedded embryos and fœtuses. For much of the following account of the development of the testicle I am indebted to his investigations, at once amongst the most recent and the most careful which we have, and the work of a Surgeon as well as of an Anatomist.

Before the actual passage of the testicle takes place through the abdominal wall, this organ has attained a position upon the brim of the pelvis, and almost in contact with the hypogastric arteries and the abdominal wall, by a gradual process of development of the adjacent parts.

The events which seem to participate in leaving the testis upon the brim of the pelvis are thus given by Mr. Lockwood in their proper sequence :—(1) Development of the mesonephros; (2) Development of the genital eminence; (3) Development and growth of the kidney behind the mesonephros and the genital eminence; (4) Development and growth of the pelvis behind the lower end of the mesonephros; (5) Alterations in the upper part of the mesonephros—*i.e.*, its partial atrophy and probable incorporation with the supra-renal capsule; (6) Growth of the lumbar spine.

I have only space here to consider those which seem to be of the greatest practical importance. For full details the reader should refer to Mr. Lockwood's interesting Lectures.

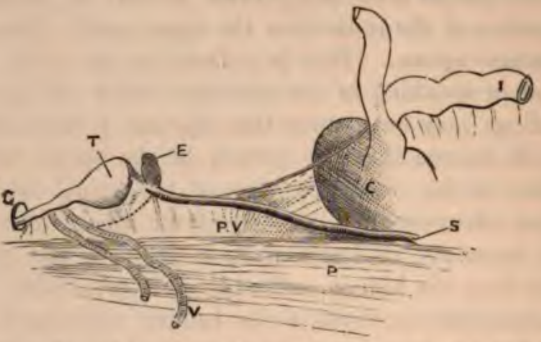
Development of the Genital Eminence.—This has been referred to above. **Development of the kidneys behind the mesonephros and the genital eminence.** The permanent kidneys, developed independently of the Wolffian bodies, start behind the lower end of these, and quickly grow forwards until they lie behind the middle third of the Wolffian body, and consequently opposite to the genital mass. Thus, as Mr. Lockwood points out, it is wrong to speak of the testicle as developing in front of the kidney. The reverse is the case, as the kidney develops after the Wolffian body and genital mass, and behind them. **Development and growth of the pelvis and spine, and their relation to the kidney and testicle.** The pelvis is developed in a mass of mesoblast opposite to the lower end of the Wolffian body, and the iliac cartilage grows upwards behind that organ. In a human embryo of the seventh week, examined by Mr. Lockwood, the main part of the genital mass was just below the kidney, and on a level with the iliac crest. But it must not be inferred from this that any movement downward of the genital mass had taken place, its position here being explained partly by the growth upwards of the pelvis behind it, and partly, perhaps, by the lower part of the genital mass being about to take a greater share in the formation of the testis than the upper part. **The growth of the lumbar spine.** This is a factor to be taken into consideration in speaking of the influence which the growth of its surroundings may have upon the adjacent position of the testis. It is well known that the growth of the spinal column is so rapid that it far outstrips that of the spinal medulla. Mr. Lockwood observes that it is significant that whilst the spinal column, especially its lower part, is growing, the genital mass separates from the kidney. During this separation the kidney remains immobile, in front of the lumbar spine, and the sexual gland maintains its original relation to the pelvis, so that one important cause of the separation is, in Mr. Lockwood's opinion, the growth of the lumbar spine.

While the testicle has, thus, by a gradual process of development and growth of itself and other parts attained a position on the brim of the pelvis, thus completing the first stage in its transition—*i.e.*, that of alterations in its position within the abdominal cavity—preparations are being already made, by the third month, for the second stage—*i.e.*, the passage of the gland through the abdominal wall and its arrival in the scrotum.

Chief amongst these preparations are the further development of the mesorchium, and of its ascending and descending processes —viz., the plica vascularis and the plica gubernatrix, the development of the gubernaculum, of the processus vaginalis, the cremaster, and, finally, that of the scrotum.

Mesorchium, Plica Gubernatrix, and Plica Vascularis.—The mesorchium is a peritonæal fold which unites the mesonephros, and afterwards the epididymis, to the back of the abdomen. At the third month it is prolonged upwards from the epididymis in a small triangular fold, and as this subsequently contains the spermatic vessels, Mr. Lockwood has called it the plica vascularis. The lower part of the mesorchium becomes continuous with a cord which, passing down outside the hypogastric arteries, ends in the abdominal wall. This cord is an early stage of the gubernaculum testis, and the downward prolongation of the mesorchium is the plica gubernatrix. This disappears below in a peritonæal pouch, the beginning of the processus vaginalis. The appearance of the mesorchium at about the end of the seventh month will be gathered from the accompanying sketch of Mr. Lockwood's (Fig. 1). The base of the mesorchium was loosely fastened along the psoas muscle, and its free edge ended upon the epidymis and testis; its upper fold contained the spermatic vessels, and its lower the gubernaculum. Mr. Lockwood has pointed out[*] that the chief interest of the upper process of the mesorchium lies, at this age, in its adhesion on the right side to the cæcum, appendix, ileum, and mesentery, thus later on explaining its important bearing upon the pathology of congenital cæcocele: on the left side it passes upwards to the sigmoid flexure.[†]

FIG. 1.



Drawing made from a seven or eight months' fœtus to show the fold (plica vascularis) which connects the testis with the cæcum. T, Testicle. E, Epididymis. P, Psoas. V, Vas deferens. G, Plica gubernatrix, disappearing into the processus vaginalis. P V, Plica vascularis. S, Spermatic artery. I, Ileum. (Lockwood.)

---

[*] The "Morbid Anatomy and Pathology of Encysted and Infantile Hernia," *Med. Chir. Trans.*, vol. lxix., 1886.

[†] According to Kocher (*Krankh d. Hoden.*; Pitha and Billroth, *Handbk. d. Chir.* § 1200), Treitz had already drawn attention to this important point.

In a fœtus of the sixth or seventh month, Mr. Lockwood found that the plica vascularis contained fibres of the gubernaculum in great abundance, these fibres probably reaching the above-mentioned organs, with which the plica is connected. It is by means of this connection of the fibres of the gubernaculum, through the plica vascularis, with the above viscera, that it comes about that when the lower end of the gubernaculum in a fœtus of the seventh or eighth month is pulled upon, not only the testis and epididymis, but the above-mentioned viscera and the peritonæum lining the back of the abdomen, glide down towards the inguinal canal and scrotum. But the production of hernia is not the only pathological condition in which the plica vascularis may play an important part. The causation of undescended testis is, in some cases, no doubt due to adhesions (*vide infra*, pp. 33, 39). Mr. Lockwood thinks that we may safely infer that these adhesions are sometimes not inflammatory, but, in reality, date to the plica vascularis, which has persisted to an unusual degree.

Gubernaculum Testis.—This structure, first described by Hunter, is a compound one, containing the plica gubernatrix and the gubernacular cord. The former has been alluded to at p. 3. The latter is a fibrous structure, the nature and uses of which have been much disputed. While all are agreed that it passes upwards to be attached to the testicle, that it lies partly in the abdominal cavity, where it receives a peritonæal covering; that it passes through the inguinal canal to end outside, there is much diversity of opinion as to its structure, its lower attachments, the amount of muscular fibre in it, and how far it is capable of contraction, and thus how far it is potent in causing the transit of the testicle. It can first be made out in the human embryo at the tenth, and easily with the unaided eye at the twelfth, week. It gains its fibres from the different layers of the abdominal wall, thus possessing fibres continuous with the external spermatic fascia, from the external oblique, and the deeper muscular fibres of the abdominal wall. These last are by the seventh or eighth month distinctly striated. Thus, there is no doubt whatever of the muscular structure of the gubernaculum. Its *upper and lower attachments* will next be mentioned. *Above*, the gubernaculum is attached to the vas, the epididymis, and afterwards to the testicle as well. The importance of any failure of, or anomalies in, the development of these upper attachments of the gubernaculum and their bearing on the non-transit of the testicle will be alluded to later (p. 40). *The attachments of the gubernaculum below* are also of much importance. They are numerous, but some are more transitory than others, and of less functional activity. (1) And amongst the earliest are attachments to the abdominal wall, the fibres of the lower end of the gubernaculum at the third month entering the abdominal wall, and interlacing with fibres descending from the external spermatic fascia and muscular layers. (2) Fibres, visible about the fifth month, attached to the pubes and root of the scrotum. (3) Fibres attached, in Scarpa's triangle, to the neighbourhood of the saphenous opening. Over-action of these fibres or weakness of others may explain crural ectopia of the testicle. This band is, according to Mr. Lockwood, transitory, being unrecognisable after the sixth month. (4) Perinæal. These end in the neighbourhood of the anus (sometimes blending with the sphincter ani) and ischial tuberosity. They are often well marked, and have been met with not only in dissection, but also in infants the subjects of perinæal ectopia of the testis. The existence of these bands can be made known by the puckering of the skin near the anus when a testicle, the subject of perinæal ectopia, is pushed upwards, and by their requiring division before such a testicle can be transplanted into the scrotum (pp. 40, 91). (5) Scrotal. The remains of these fibres can be seen by the inversion of the scrotum which follows on any dragging of the testicle out of the scrotum in a child which is being operated on for radical cure of hernia. In later life, when castration is being performed, and the testicle is almost completely shelled out of the scrotum, the remains of these fibres passing to the fundus scroti still require division before the testicle comes away.* It is noteworthy that these lower attachments of the gubernaculum are not developed till a later date than the upper. Thus, at first the gubernaculum only reaches from the abdominal wall to end above upon the testis and epididymis. Bramann showed (*Arch. f. Anat. und Entwick.*, Hft. 3 and 4, 1884) that the gubernaculum had originally no attachment to the bottom of the scrotum by the fact that when the early gubernaculum is pulled upon from within, the abdominal wall is raised up and dimpled, but the scrotum is not pulled up with it.

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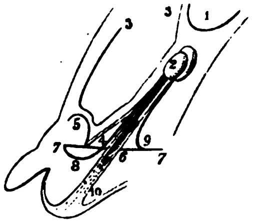
* Kocher (*loc. supra cit.*) thus describes the fate of this scrotal attachment of the gubernaculum. "The part which goes into the scrotum shrinks into a band-woven relic, which persists as a firm adhesion between the hinder and lower part of the testicle and the skin. The evidence of this may be ascertained in inflammation of the testicle, and in castration." In one case of marked retraction of the testicle Godard observed a puckering in of the scrotum.

With regard to *the structure of the gubernaculum*, which has been much disputed, it is, in its completer form, somewhat complicated, consisting, as it does, of a central cord of connective tissue, of muscular fibres derived from the abdominal wall, and of a tubular sheath of peritonæum. The muscular fibres are, of these, the most important. They are probably of two kinds. Thus, fibres ascending from the innermost layers of the abdominal wall, along the gubernaculum, immediately below its peritonæal covering, were recognised by Hunter long ago in such animals as the hedgehog. In the human fœtus their presence can be recognised at the third month, by the seventh or eighth they are abundant and distinctly striated. The existence of another kind of muscular fibres at an earlier stage has been made probable by Mr. Lockwood. Thus, he describes at the third month fibres with a decided likeness to unstriped muscular tissue, and probably of that nature.

The above brief remarks on the structure of the gubernaculum lead up to the question of *its function*, a question even more disputed than its structure. Many observers (*e.g.*, Prof. Cleland) have considered that in the descent of the testicle, the gubernaculum plays no active part; others have thought that while it is incapable of contracting, the shortening of its connective tissue in the later months of intra-uterine life may help in the descent of the testicle. Finally, others, like Mr. Curling, have held that the fœtal gubernaculum corresponds to the cremaster of later life, and that it plays an important part in the passage of the testicle. Mr. Curling found that on laying open the inguinal canal and gently pulling upon the gubernaculum, its muscular fibres could be traced into three processes, each having a distinct attachment. The external or broadest is connected to Poupart's ligament in the inguinal canal: the middle forms a lengthened band, which, escaping at the external abdominal ring, passes to the bottom of the scrotum, where it joins the dartos; the internal has a firm attachment to the os pubis and sheath of the rectus (Fig. 2). As the attachments of the muscle of the gubernaculum and those of the cremaster in the adult are exactly similar, Mr. Curling entertained no doubt of the identity of the two muscles. He held that the fibres proceeding from Poupart's ligament, and the internal oblique, tend to guide the gland into the inguinal canal; those attached to the os pubis to draw it outside the abdominal ring; and the process extending to the bottom of the scrotum, to direct it to its final destination.* In the transit of the testicle to the bottom of the scrotum, the gubernaculum, including its peritoneal investment and muscular fibres, undergoes the same change as that which takes place in certain of the Rodentia at the access of sexual excitement, its muscular fibres being gradually everted, until when the transit is completed it forms a muscular envelope external to the process of peritoneum which surrounds the gland and front of the cord. They are thus enabled to acquire

FIG. 2.



This and the next figure show Mr. Curling's views on the cremaster.

Diagram to show the relations of the cremaster before the descent of the testis. 1, The kidney. 2, The testicle. 3, 3, The peritonæum. 4, Vas deferens passing down into the pelvis by the side of the bladder. 5, The bladder. 6, The abdominal ring. 7, 7, Poupart's ligament. 8, Pubic portion of cremaster. 9, Fibres of cremaster arising from Poupart's ligament. 10, Portion of the gubernaculum attached to the bottom of the scrotum. (Curling.)

FIG. 3.

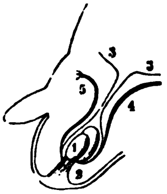


Diagram of the testicle immediately after its arrival in the scrotum, the cremaster being everted. 1, The testicle. 2, The shortened gubernaculum. 3, 3, The peritonæum. 4, Portion of the cremaster arising from Poupart's ligament. 5, Pubic portion of the muscle. (Curling.)

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* Kocher is in agreement with Mr. Curling as to the existence and function of these three lower attachments of the gubernaculum. Mr. Lockwood holds a somewhat different opinion as to their action. He considers that the scrotal attachment is not powerful enough to draw the testicle into its final resting-place, and thinks that it is by means of its well-attached perinæal fibres that the gubernaculum is able to effect its purpose, the scrotal band merely influencing the final position of the gland.

the new functions of elevating, supporting and compressing the gland.

It will be seen that the chief points in favour of the gubernaculum playing an active part in the transit of the testicle are its undoubtedly muscular structure, the fact that its lower fibres are attached in regions—viz., the perinæum, &c.—into which the testicle is occasionally displaced, and its analogy with the cremaster in many of the lower animals.

The processus funiculo-vaginalis.—This is the pouch of peritonæum which paves the way for the passage of the testis before this organ makes its start,* eventually becoming the parietal layer of the tunica vaginalis. The exact date of its appearance is uncertain. Mr. Lockwood thinks that a dimple in the peritonæum at the lower end of the plica gubernatrix, found in a fœtus of the sixteenth week, was the early stage of the processus.†

In a fœtus of the fifth month, Mr. Lockwood has found the process to be a funnel-shaped canal, wide above and pointed below, ending at this date in the midst of the muscular fibres of the internal oblique and transversalis. Later on, when it has descended lower it becomes more capacious below. The same authority believes that this process is produced from without by the traction of the gubernaculum which is attached to it, not by any force acting from within the abdomen. Later on, when the processus funiculo-vaginalis closes, this commences at two spots near the internal abdominal ring, and just above the testicle. Obliteration commences at the former spot first and descends, and a little later above the testicle, the change ascending, until nothing is left of the peritonæal vaginal process save a fibrous cord; which continues to shrivel, and the detached lowest part of which persists as the tunica vaginalis.

The Cremaster.—While the anatomy of this muscle, its attachments externally to Poupart's ligament, and internally to the pubes, with its intermediate loops descending on the cord or even on the testicle, is agreed upon, its origin is still disputed.

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* That the formation of the funiculo-vaginal canal is independent of the migration of the testicle is shown by the fact that the canal may exist, though the transit of the testicle may not have taken place. Bramann (*Arch. f. Klin. Chir.*, March 1890, Bd. xl. S. 157) proved the existence of the canal in five cryptorchid infants. Again, though the testicle may not have migrated, the vas deferens may have passed in front of it along the above canal, and be found in the scrotum.

† Kolliker and Bramann say that the process begins at the third month, and Weil at the end of the second.

On this point there are two main views. (1) That the cremaster is formed out of the striped muscular fibres which ascend upon the gubernaculum from the abdominal wall. This view originated with Hunter, who saw these fibres in the ram become inverted when the gubernaculum was seized beyond the abdominal wall and pulled downwards. Mr. Lockwood considers that while these ascending fibres may help slightly to draw the testicle down, the ascending cremaster in the human embryo is so trivial, that perhaps it ought to be looked upon as a mere survival of a muscle, more active and better developed in some of the lower animals. (2) With regard to this view that the cremaster is an appendage of the internal oblique which is displaced downwards to the scrotum by the testicle in its transit, the above authority considers that it is not borne out by his section-specimens. The cremaster develops long before the transit of testis, and indeed before the funiculo-vaginal processus has appeared. Towards the end of the seventh month of intra-uterine life, this process is so far ahead of the testicle that it must have anticipated it in any action that the testicle might have had in carrying down the cremaster. It would be more rational to attribute the formation of the muscle to the gradual advance of the peritonæal pouch rather than to that of the sexual gland (Lockwood).

The Scrotum.—Of the two apertures in the fœtal perinæum, the anterior or urogenital one, situated below the rudimentary penis or clitoris, as the case may be, has on either side of it a fold of skin. If the sex prove female these folds remain separate, the labia majora, but if a male be developed they fuse along a median raphè to form the scrotum. This takes place between the third and fourth months, the scrotum being thus formed long before the transit of the testicle is accomplished, and quite independently of it.

The chief structures concerned in the migration of the testicle having been considered, it remains to recapitulate briefly the causes of this migration and the points of practical importance which may result when this migration is prevented or irregular.

We have seen that the testicle is developed in the lumbar region on the inner side of the Wolffian body or primitive kidney. This position it occupies for about three months. By the tenth week the genital mass is actually a testicle, the tunica albuginea and tubuli seminiferi having appeared, and this organ, together with the Wolffian body, or, as it is becoming, the epididymis, lie just below the kidney,[*] and upon the venter of the iliac cartilage. It will be at once recognised that the testis is from the first placed much lower down, and that thus the distance which it has to traverse in its migration is, to begin with, less than is usually realised.

At the twelfth week the position of the testicle is about the same, but its mesentery is now longer and more developed.

During the next few months complete and exact evidence as to what happens to the testicle is not at hand, but while it is probable that it undergoes little change itself, it is certain that its other surroundings are undergoing marked development, and that important structures—*e.g.*, the gubernaculum, funiculo-vaginal process, &c.—concerned in the transit of the testicle and its final reception when the transit is completed, are growing rapidly.

The exact date of the entrance of the testicle into the inguinal canal is not yet known. At the end of the sixth, or during the seventh, month it traverses this region, from the seventh to the eighth month it reaches the external abdominal ring, and by the end of the eighth, or during the ninth, month the testicle has usually reached the bottom of the scrotum.

Causes of the Transit of the Testicle.—While these are still matters of controversy, and while no wholly satisfactory explanation of the transit has been given, it is most probable that the following may be assigned as the most important factors :—

1. **The original position of the testicle is very low down to begin with.**

2. **The unequally rapid growth of certain of the surroundings of the testicle,** which bring about concomitant changes in the position of the gland itself—*e.g.*, the growth of the lumbar spine, and that of the iliac part of the pelvis in an upward direction (p. 3).

3. Possibly **pressure exerted by some of the adjacent viscera.** Thus, Bramann considers that the fact that the left testicle is a little the first to start is due to the pressure of the expanding sigmoid which is gradually filling up with meconium.

4. **The Gubernaculum.**—After what has been already stated it must be sufficient to say here that it is only rational to believe that this structure plays an important part in the transit of the

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[*] The separation of the testicle below from the true kidney above is in part brought about by the growth of the lumbar spine (*vide supra*, p. 3), the development of the kidney, and that of the pelvis.

testicle. Thus, muscular tissue, both striped and unstriped, and connective tissue are here present.* Above, it is attached to organs—*e.g.*, testis, epididymis, and vas deferens, which do descend normally, and occasionally to others—*e.g.*, peritonæum and intestine (Fig. 7), which may descend abnormally in herniæ. Below, it is attached on either side of the external ring (to the pubes and to Poupart's ligament), through which the testis passes, and, lower still, though this has been much disputed, to the fundus scroti. While the above are the normal attachments of the gubernaculum below, it has other attachments, some of which are occasionally well developed (*e.g.*, in the perinæum) in places to which the testicle is occasionally found to pass abnormally. Again, there is the fact that if traction be made upon the gubernaculum in a fœtus in which the transit of the testicle through the abdominal wall has not begun or is not yet completed, the testicle will be seen to move in a downward direction.

5. **The presence, ready prepared, of a passage with smooth walls, the funiculo-vaginal process,** the open mouth of which is situated close to the testicle before it passes out of the abdomen, and the lower end of which reaches into the scrotum. The presence of this structure, as it were, invites the testicle to change its position from an intra- to an extra-abdominal one, and it must require the exertion of very slight force, whether traction from below or pressure from or changes in the surrounding structures above, to start the testicle thus situated. And the very slightness of these forces probably accounts for the comparatively long time taken—from the end of the sixth to the ninth month—in the completion of the transit of the testicle.

6. Before leaving the causes by which this transit is brought about it is right to add that the ones above given acquire some negative value owing to **the weakness and inadequacy of the other factors which have been advanced.** I have only space to refer to some of these. (*a*) The weight of the testicle. Prof. Sappey (*Anat. Descript.*, tom. iv. p. 584) dismisses this owing to the minuteness of the organ, which is only 3 millimetres in diameter, and because, as he says, if it acted at all this factor ought to have kept the testicle in the abdomen, as the pelvis is usually the highest part of the fœtus. (*β*) Contractions of the abdo-

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* How far the action of the gubernaculum is due to the contraction of its smooth or striped muscular fibre, and how far to its connective tissue becoming shortened, when fibrous, is uncertain.

minal muscles and diaphragm, of which proof is entirely wanting. (γ) The view of Prof. Carus, according to which the testicle in some mysterious way had the power of making way through the abdominal wall by depressing some of its layers. This theory, which, in Prof. Sappey's words, makes the testicle move with the power and after the fashion of a projectile, is purely speculative, is based upon no proof, is contrary to the researches of Hunter upon the gubernaculum, and he might have added, takes no account of the fact that the testicle finds a canal ready developed for its transit and with its upper opening placed close to it, and, as it were, inviting it to enter. (δ) Finally, there is **the view of Mr. Bland Sutton[*] that the descent of the testes is in every respect to be regarded as a hernia of those bodies,** and that in the first place it probably originated as such, thus coming into the category of inherited pathological conditions. While it is extremely difficult to criticise the observations of so brilliant and experienced an observer as Mr. Sutton, I am obliged to dissent from the arguments which he advances in favour of the above view. The following are the chief reasons which induce him to "regard the descent of the testicles as of the nature of a perpetuated hernia":—

(1) "They leave the abdomen at a region where hernia would be most likely to occur—viz., at points of least resistance."

Now while it is probable that the fœtal testicle finds a weak spot ready for it to leave the abdomen (*vide supra*, p. 12), it seems to me that there is no real comparison between a testicle which, submitted to gentle coaxing pressure by the parts around, and also gently pulled upon from below, finds at this spot a weak place and a smooth-walled pouch ready to hand for its transit, and a piece of intestine or omentum forced out later on in life, either after repeated straining, or because the peritonæal process is imperfectly obliterated, and the abdominal contents are now submitted to such constant strains as those entailed by crying, &c.

(2) "The more erect the posture assumed by the animal, the greater is the liability to hernia. Hence, mammals, like the kangaroo, monkeys, &c., present descended testicles, whilst in mammals which habitually maintain the horizontal position, like the monotremata, porpoise, &c., the testicles are renal in position." I do not know whether in the above use of the word "hernia," Mr. Sutton refers to hernia of the testicle. But certainly hernia,

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[*] *Introduction to General Pathology*, p. 374.

in its actual sense—*i.e.*, protrusion of intestine or omentum—is by no means unknown in animals which usually "maintain the horizontal position"—*e.g.*, the dog and horse.

(3.) "Hanging by the mesorchium, pendulous in the body cavity, the testicles are in the most favourable position possible to become herniated in all conditions involving increased strain on the abdominal position." To this I should reply, that while it is probable that in some cases the fœtal testicle is thus pendulous, I believe that such a condition is usually met with in testes which have not left the abdomen, that it is not present as a rule judging from dissections and other means of investigating the fœtal testis. Again, there is no reason whatever to believe that the fœtal abdomen is ever "in conditions involving increased strain on the abdominal parietes," at least before parturition, and by this time the testicles have usually reached the scrotum.

(4.) "Descended testes are certainly not an advantage to the animal; perhaps the reverse of this is true." I have later (p. 18) tried to show that while this may be true of most animals, it is not so in the case of man.

The different pathological conditions which may follow on deficiencies or errors in the development and transit of the testicle.—To enumerate these, we must go back to an early date, for while the most important abnormalities follow on the second stage of the migration of the testicle, especially on its passage through the abdominal wall, there are others connected with the first stage, while the testicle is stationary within the abdomen, and others earlier still, which are explained by its development while it is still in relation with the Wolffian body.

And at this point it may be convenient to give the following list[*] of the various structures which are more or less connected in their development with the Wolffian bodies.

	IN THE MALE.	IN THE FEMALE.
The **genital mass** becomes	Testicle.	Ovary.
Wolffian body becomes— A. **Its sexual part**	Epididymis and its vasa efferentia or coni vasculosi.	Epoophoron of Waldeyer. Parovarium of Kobelt. Organ of Rosenmüller.

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[*] The first part of this is given by Mr. Lockwood.

	IN THE MALE.	IN THE FEMALE.
B. **Its urinary part**	A. Paradidymus of Waldeyer, or organ of Giraldès. B. Vasa efferentia.	Paroophoron of Waldeyer.
Wolffian duct becomes	Vas deferens. Ejaculatory Duct. Vesicula seminalis.	Almost entirely disappears. In some animals it persists as duct of Gaërtner.
Duct of Muller	Almost entirely disappears. A trace persists as the hydatid of Morgagni. Another part forms the prostatic vesicle.	Fallopian tube. Vagina and uterus.

1. **Fusion of the Testicles: Synorchis.**—An instance of this extremely rare condition in which not only the testicles retained in the abdomen, but also the kidneys and the supra-renal capsules were fixed together in the middle line, is recorded by Cruveilhier (*Traité d'Anat. Path. Gén.*, t. i. p. 301). Mr. Lockwood (*loc. supra cit.* p. 50) met with one instance in a human embryo, at about the fifth week of intra-uterine life, in which, while the upper ends of the Wolffian bodies and the genital eminences were normal, the lower ends of the former bodies were fused together in the middle line. He considered that if this fœtus had come to maturity, the testicles must have become fused together also.

2. **Persistence of Fœtal Relics.**—It will be seen later on (Encysted Hydrocele), that at or near to the same spot where encysted hydroceles occur with especial frequency—*i.e.*, in the neighbourhood of the head of the epididymis—we have the three following relics of fœtal structures. This fact, together with the frequency with which cysts arise in this neighbourhood, makes it very probable that encysted hydroceles sometimes originate in enlargement of hitherto quiescent fœtal relics. (α) Vestiges of the duct of Müller persisting as the hydatid of Morgagni. (β) Vestiges of some of the urinary tubules of the Wolffian body forming the organ of Giraldès. (γ) Remains of

some of the above same tubules persisting as the vasa aberrantia of Haller.*

3. **Conditions Associated with the Mesorchium, and its two parts, the Plica Vascularis and the Plica Gubernatrix.**—Over-length and looseness of the mesorchium may perhaps keep the testis loose in the abdomen and so prevent its entering the inguinal canal. And the same result may be brought about in a different way by adhesions resulting in some cases from fœtal peritonitis, in others from the existence of persistent and impeding relics of the plica gubernatrix.

4. **Conditions Associated with the Gubernaculum.**—These may be (*a*) imperfect development of this structure, and, especially, in all probability, deficiency of its muscular fibres. (*b*) Imperfect attachment of the upper fibres of the gubernaculum to the testicle, epididymis, and vas deferens. Thus, all these upper attachments may be wanting, or those to the epididymis and vas deferens may be present, but not those to the testicle. Thus, while the latter remains in the abdomen, the two former may be moved down towards or into the scrotum. (*c*) The upper attachments of the gubernaculum into the peritonæum and to certain viscera—*e.g.*, the cæcum—may, as pointed out by Treitz and Mr. Lockwood, bring about by traction hernial sacs, and such hernia as cæcoceles.† (*d*) The lower attachments of the gubernaculum. Deficiency of these, especially the scrotal, may prevent the full migration of the testicle. On the other hand, over-development of some other of these lower attachments—*e.g.*, the perinæal—may land the testicle in abnormal sites.

5. **Imperfect Development of the Inguinal Canal and the External Abdominal Ring.**—This is supposititious only.

6. **Non-development of the Scrotum.**

7. **Conditions Associated with the Funiculo-vaginal Process.**—If this be deficient the paving of the way for the migration

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* Luschka (Virchow, *Arch.*, Bd. vi. S. 310) having found this vas aberrans converted into a cyst, suggested that it might occasionally form an encysted hydrocele. Mr. Lockwood (*loc. supra cit.*, pl. ii. fig. 36) figures a very interesting specimen in which four such vasa aberrantia were present.

† Mr. Lockwood points out that this condition will be helped by the fact that there is much difference in the degree of closeness with which the peritonæum is attached to the anterior and posterior wall of the abdomen. Thus, to the anterior wall the peritonæum is bound so closely as to be incapable of much displacement or of taking part in the formation of hernial sacs. To the posterior wall, on the other hand, the attachments of the peritonæum are much less close, and being underlaid by abundant loose areolar tissue and fat, are easily displaced and thrown into folds.

of the testicle will be much interfered with. So also, later on, imperfect obliteration of it may lead to congenital or infantile hydrocele, hydrocele of the cord, and to different forms of hernia. The fact that this process comes down independently of the testicle also explains the fact that a hydrocele may exist below, while the testis is retained above.

8. **If the sub-peritonæal fatty tissue which accompanies the funiculo-vaginal process** towards the scrotum persist, it may develop, later on in life, into the well-known lipomata of the cord.*

(ii) **Why does the Testicle pass out of the Abdomen?**—When we consider that this seems to favour hernia, by leaving a weak spot, and exposes the testicle to injuries which it would have escaped, if, as in other animals, it had remained in the abdomen, we may be sure that there are excellent reasons for its transit. They are chiefly two, and are connected with (A) its diseases in man, and (B) its functions. But before I speak of these, I would point out that the extent to which the transit of the testicle in man favours the production of hernia and exposes the organ to injury is apparent rather than real. We certainly see congenital hernia and infantile hydroceles frequently enough in the children of the poor, and it is impossible to deny that the weakly or imperfect closure of the congenital canal does play a part in predisposing to the production of hernia. But it is very seldom that this alone is responsible. Other causes, and more powerful ones, are also present—*e.g.*, premature birth, by which insufficient time has been given for perfect development, injudicious feeding giving rise to intestinal disturbance, liability to catarrh of the respiratory organs, producing cough thus early, and constantly taxing the closure and obliteration of the parts concerned in the transit. Phimosis, again, is another very common cause of hernia-production in these children, and one frequently overlooked.

So, too, with regard to the risk of exposure to injury which the extra-abdominal position of the testicle entails, this again is far more apparent than real. In the first place, while inflammation of the epididymis and testis from urethral causes—*e.g.*, gonorrhœa—is very common, traumatic inflammation of the testis is infinitely rare. To meet injuries, there are certain especial provisions made. (1) The mobility of the testis, from its pendent position, and serous membrane. (2) The position of the testis, one being at a lower level than its fellow, so as to slip readily beneath it, out of harm's way, as in the frequent action of crossing the thighs. (3) The contractile power of some of its coverings—*e.g.*, the dartos and cremaster.

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* This subject will be found treated under Part II. DISEASES OF THE CORD. See also a paper in the *Pathological Society's Transactions*, vol. xxxvii. p. 451, by Mr. J. Hutchinson, jun.

It has been stated above that the reasons of the transit of the testicle in man are mainly two. (A) **Those connected with its diseases,** and (B) **Those which go hand in hand with the peculiarities in the structure and functions of the organ.** (A) **The transit of the testicle in man certainly anticipates the frequency of certain diseases of this organ in him.** I have only space to allude to two especially—viz., acute inflammation and tubercular disease. With regard to the most frequent form of inflammation, gonorrhœal or urethral epididymitis, it is easy to see what would have been the results if the testis had remained in the abdomen, no longer easily got at, with such surroundings as the peritonæum. The rapidity with which acute pain, swelling, redness, and the implication of the scrotal tunics follow, all point to what would have happened; and if there were any doubts on this point they would be removed by the case at p. 62, in which a retained testis was the cause of fatal peritoneal inflammation, set up by an injury.

So, too, with regard to tubercular disease. With the organ situated externally, we are able to attack small deposits with a sharp spoon, and when the disease is more extensive we are able to give much, and sometimes permanent, relief by castration. It is easy to see how different would have been the results if the testicle had had its permanent home behind and close to the peritonæum, say in the iliac fossa. The softenings of tubercular deposits, the formation of adhesions to neighbouring parts and viscera, would have borne a very different aspect. We should have had to face a fresh and graver source of peritonitis, and the testis would now have been a starting-point of as grave and as often fatal mischief as the vermiform appendix.

The above argument, that the transit of the testicle is of obvious advantage to man, in that it allows diseases of these organs to be more efficiently dealt with, has been criticised by a very brilliant writer, Mr. Bland Sutton, on the following grounds (*Introduction to General Pathology*, p. 375): "It is a weak argument, for the same line of reasoning would apply to the kidneys, the lungs, and other viscera." To this argument I would reply, that where certain special conditions make such a position desirable, the lungs or their equivalents are found more externally placed. In man alone certain diseases are found very frequently to attack his testicles or their appendages, and therefore these organs alone are found, in the normal condition, permanently outside his body; certain disadvantages which this position entails being largely, at all events, made up for by certain definite precautions to which I have already drawn attention. The extra-abdominal position of these organs is by these means rendered compatible with long and healthy life, a result which certainly could not have been secured if the other organs referred to by Mr. Sutton had been outside man's body. The kidney, no doubt, is liable to acute inflammation, but more rarely than the testicle, and in a form far more amenable to medical treatment, and far less liable to spread to other parts than we have reason to believe would be the case with acute inflammation of the testis if this organ had also been, all life long, intra-abdominal.

With regard to the disadvantages which the transit of the testicle entails, I have not made light of them, but I have pointed out how, in fact, these disadvantages—that of exposure to injury, for instance—are met. With regard to other disadvantages, man, no doubt, by the position of his testicles, is rendered liable to hydrocele and hæmatocele, while other animals are, by the intra-abdominal position, rendered free of the risk of such diseases. But with regard to this point it must not be forgotten that man is, from his habits, less liable to the above diseases than animals would have been, and that he alone is able to secure efficient treatment for such affections when they occur. Such a sentence as, "Carefully considering the evidence, those animals with the testicles lying normally under the kidneys are in a more satisfactory condition than those having the organs normally lodged in the scrotum," entirely, I think, loses sight of the fact that with this particular position in man goes his liability to certain special disorders of his testicles.

So far we have been concerned with the pathological argument. (B) Prof. Cleland pointed out that **the structure and function of the testicle supply another argument for its extra-abdominal position.** Thus, he believes that the scrotal site, the pendent position, and the arrangement of the blood-supply to the testicle, are all associated with the fact that the testicle is the most complicated of all glands, its secretion the most elaborate, and, a further point, that its secretion is not always to be made use of, but only to be discharged, and that rapidly, at somewhat uncertain periods. Now, surrounding the testis we have the dartos and cremaster muscles, and the tunica albuginea, that dense tough capsule, which, like the sclerotic, is protective, while allowing of very little expansion. Further, the vessels are peculiar as well as the tunics—viz., a long artery which is said by some not to diminish in diameter as it descends, and then, with its branches, becomes tortuous. The veins, too, are large and numerous, and without valves, or only imperfect ones. Now, from its pendulous position, the free arterial supply, and the fact that the venous current is slow (the veins having no valves, and being weakly supported), the testicle structure is almost, as it were, in a bath of slowly moving blood, slow from the tortuous artery and its branches, and the condition of the veins.

If this be so, there must be some arrangement to meet the trouble that would arise from the constant collection of seminal fluid resulting from this bath of blood. This is afforded by the structure of the tunica albuginea. From its density and want of elasticity it can expand but little, and so admits but a limited amount of fluid at a time. Thus, when the seminal tubules are full there is no more room, and no more blood can get in, and thus no more secretion can take place, the seminal fluid, if not required, being partly absorbed *in situ*, and partly along the vas deferens. If, on the other hand, the tubules are empty, the pendent position and the arrangement of the blood-supply of the testis allow of the blood rapidly filling the vessels, and thus the testis is best disposed for fresh secretion. If the testis had been in the abdomen the loose pendent position, on which much of the peculiarity of its blood supply depends, would have been impossible, as the testicle would have been liable to be caught up by, and entangled in, coils of intestine.

CHAPTER II.

CONGENITAL ABNORMALITIES AND DEFECTS OF THE TESTICLE AND ITS ANNEXA.

JUST as **two complete stages, Development** and **Transit** are included in the early history of the testicle, so **two distinct groups of anomalies, those connected with its development, and others with its transit,** have to be considered. How closely the above two stages are related is shown by the fact that any fault in the development of the testis will interfere with its migration, and, inversely, a faulty transit must of necessity prevent the proper development.

Congenital Anomalies of the Testicle.

A. Anomalies in Development.	Anomalies in number.	In excess.		Polyorchismus.
		In deficiency.	Absence.	Anorchismus.
			Fusion	Synorchismus.
	Anomalies in size.	In excess.		Hypertrophy.
		In deficiency.		Atrophy.
B. Anomalies in Migration.	Testicle undescended. Ectopia.	At some point of its normal course. Retention.		
		Outside its normal course. Ectopia.		
	Testicle descended. Inversion.			

(Monod and Terrillon, p. 2.)

SECTION I.

ABNORMALITIES IN DEVELOPMENT.

Supernumerary Testicles. Polyorchismus. — The instances given of these are unreliable. Thus, in every[*] case in which an "additional testis" has been submitted to careful test—*i.e.*, during life by operation, *e.g.*, tapping, or after death by dissection—its existence has been explained by some well-known pathological condition. Thus, it has been found to be an encysted hydrocele,* an omental hernia,† a fibrous tumour of the cord or tunica vaginalis.‡

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[*] Perhaps an exception must be made here for the case which Blasius (*Obs. Anat. Pract.*, 1674. Pl. vi. Fig. 8) has recorded as one of "testis triplex." Here two testicles are described and figured as having been found, post mortem, on the right side. On this side are two spermatic arteries and veins: on the left these vessels are single. It is impossible to make out from the plate whether the testicles had ever descended. The description is extremely short. No mention

In the verification of these conditions, the absence of testicular sensation,§ and the facts that no cord can be traced to them, and that they are not congenital, are the best guides. However closely a body in the scrotum may seem, in size, shape, and sensitiveness, to correspond to an additional testis, it must not be accepted as one unless operation or an autopsy allow an opportunity of complete investigation,‖ including the use of the microscope. In some a bifurcation of the vas deferens has been apparently made out.¶ This is probably fallacious. It is noteworthy that Mr. Curling, in his examination of a patient supposed to have

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is made of the vasa deferentia, and we have, of course, no microscopical examination. As is so frequent in the descriptions of these cases by the old writers, the subject of this abnormality is said to have been "valde libidinosus."

* This, from its rounded outline, and its close connection with the testis, may be mistaken for a small additional testis. Some years ago a man presented himself at my out-patients at Guy's Hospital as "the man with three testicles." The third testicle was here an encysted hydrocele, and disappeared on tapping.

† Even Morgagni was deceived by a piece of omentum "which had descended into the scrotum wrapped up in its proper sacculus of peritonæum," and had the candour to allow it. (*Seats and Causes of Diseases*, vol. ii., "Dis. of the Belly," p. 545.)

‡ In the Museum of St. Thomas's Hospital is a specimen showing that the body supposed during life to have been a third testicle is really a fibrous tumour attached to the tunica vaginalis.

§ Not even this is decisive. Thus, I have twice had patients with encysted hydroceles who, owing to the intimate connection of the hydrocele with the testis, spoke of testicular sensation being present in the swelling.

‖ Thus, in the cases of supernumerary testicle recorded in the *Lancet*, 1865, vol. ii. pp. 448, 473, 501, there is no proof beyond that of external examination. So, too, with the three cases of polyorchismus recorded *Lond. Med. Record*, 1884, p. 170 and Oct. 1881. They appear to have been met with in Bulgarian and Russian soldiers. In the first, it was thought that two testes, one lying above the other, were present in the right half of the scrotum. In the second, two testes were made out in the left scrotum, each appearing to have an epididymis and cord. In the course of a gonorrhœa the patient had left epididymitis, which only attacked the lower of the two testes. The patient stated that the upper left testicle descended when he was eight. In the third case, four testes are said to have been present in a normally developed scrotum.

¶ Thus, in a case of Dr. F. Hewett's, in which two testes were thought to be present on the left side, it is stated that "the vessels, &c. of the two glands on the left side united to form a single spermatic cord above the smaller gland, in which, on manipulation with the fingers, two of its constituents, of firmer feel and structure than the rest, could be isolated, being most probably the deferent ducts of the glands."

two testicles on the right side, the lower of which proved to be an encysted hydrocele of the testis, found that "something like a vas deferens even could be traced to the lower tumour, but compression of it produced scarcely any uneasiness." One fallacy must always be remembered, and that is, that the structures in the cord may sometimes be easily separated into two bundles, one formed by the spermatic vessels, the other by the vas deferens and its artery.

In cases where the penis is double the number of the testicles is not increased.

While there is no case of supernumerary testicles in man, which, having been submitted to the necessary tests, can be considered absolutely reliable, it would appear probable from Comparative Anatomy that such a case may in future, though very rarely, be verified. Thus, veterinary surgeons, when castrating calves and colts, occasionally meet with this condition.

Anorchism. Monorchism. Absence of one or both Testicles.—These conditions, though more frequently met with[*] than the preceding one, are rare. Several possible fallacies must be remembered before an apparent instance of this anomaly can be accepted as such. Thus, retention of the testicle, imperfect development, and extreme atrophy of the gland, have all been described as instances of its absence. Cases diagnosed on the living, without the confirmation of an autopsy, are subject to suspicion.

But it is not only the above fallacies, and mistaking apparent for real absence of the testicle, which have led to errors, but further confusion has arisen from forgetting that with absence of the testicle may co-exist absence of parts of its annexa and excreting apparatus, or these may be present and the testicle itself absent.

Accordingly, this will be the most convenient place for describing other deficiencies in the seminal apparatus, which may occur either independently of, or together with, anorchism or monorchism. The following varieties have been thus classified by French writers:[†]

1. Absence of the Testicle only. 2. Absence of the Tes-

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[*] Thus, Gruber, of St. Petersburg (*Zeitsch. der k.k. Gesellschaft. der Aertze in Wien;* Canstatt's *Jahresbericht*, 1868), has collected 31 cases. In eight of these the absence of the testis was bilateral.

[†] MM. Gosselin and Welther, *Nouv. Dict. de Méd. et de Chir. Prat.*, t. xxxv. Monod and Terrillon, p. 6.

ticle, the Epididymis, and a portion, more or less extensive, of the Vas Deferens. 3. Absence of the Whole Apparatus. 4. Absence of all or part of the Excretory Apparatus, the Testicle being present. 5. Bilateral Anorchism.

As the testis and epididymis are looked upon as forming a single organ, it might naturally be supposed that, if the testis were absent, its excretory duct would also be wanting. This is not always so. When it is remembered that, at a certain period of embryonic life, the epididymis and testis are developed separately, it is easy to understand that only one of the two structures may be absent.

1. **Absence of the Testicle only.**—This is explained by the original independence in development of the testis and epididymis. Four or five cases have been recorded. The testis being absent the vas deferens is found to end in a small body, more or less closely resembling an epididymis. In most of the cases the epididymis has been met with in the scrotum. In one, a fœtus of four months, a case of Godard's, the right testis was retained in the iliac fossa; on the left side the testicle was entirely wanting, the seminal apparatus commencing here in the epididymis, which, with the vas deferens and vesicula seminalis, was normally developed. Traced in the other direction, the vas has been found to run a usual course and end in a vesicula seminalis. In adults this contains mucus devoid of spermatozoa.

2. **Absence of the Testicle, the Epididymis and more or less of the Vas Deferens.**—This variety, much the most common, includes the greater number of the cases described as unilateral anorchismus.

The portion of the vas deferens which persists presents itself as a cord which, starting from the vesicula seminalis, loses itself in a thread-like extremity in the neighbouring connective tissue, at a varying distance from its starting-point. In extreme cases, the vas ends close to the vesicula seminalis, the latter being in these cases remarkably small and atrophied.[*]

More frequently, the vas deferens can be traced for a varying extent along its normal course between the vesicula seminalis and the scrotum. Thus, it has been found to end at the point where it crosses the ureter,[*] at the outer inguinal fossa of the peritonæum,[†] at the level of the external inguinal ring.[‡] Lastly, in one case, the vas has been found to pass through the external ring and to end in the superficial parts after the manner of the round ligament.[§]

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[*] Cruveilhier, *Traité d'Anat. Path. Génér.*, t. iii. p. 24; *Traité d'Anat. Descr.*, 5th ed. t. ii. p. 358; Denonvilliers, quoted by Godard, *Recherch. Tératol. sur l'Appareil Séminal de l'Homme*, 1860, p. 35; and *Étude sur l'Absence Congénitale du Testicule. Thèse de Paris*, 1858, p. 39.

In all these cases the scrotal part of the seminal apparatus was wanting. The part of the vas deferens present is usually normal in size and permeable to injection. The vesicula seminalis (as pointed out by Godard, merely a dilatation of the vas deferens) is only wanting when the terminal part of the vas is itself deficient.

In other cases it has been the opposite end of the vas deferens, which, together with the testis and epididymis, has been wanting. Thus, in a case of Godard's (*loc. supra cit.*), the testicle and epididymis were absent, the vas deferens began in the scrotum as a blind pouch and ran up, closely applied to the funiculo-vaginal process of peritonæum, into the inguinal canal, where it came to an end. The vesicula seminalis on the same side was wanting.

(*c*) **Entire Absence of the Seminal Apparatus.**—This variety is extremely rare. The extreme cases of the last-described variety (cases of Cruveilhier and Denonvilliers), in which the only part of the seminal apparatus present was the vesicula seminalis and a small part of the vas, lead up, naturally, to those cases where the entire seminal apparatus is deficient. Two such cases have been recorded.[||]

(*d*) **Absence, Total or Partial, of the Excretory Apparatus, the Testicle being present.**—In this variety, as in number (*b*), more or less of the excretory apparatus is wanting, but the testicle itself is present. This abnormality is interesting, as it seems to prove an exception to the general rule by which any persistent obstruction to the outflow of the secretion of a gland leads to alteration in and finally atrophy of that gland. Not only does mal-development, but experiments also, prove this to be the case. Thus, Sir A. Cooper, Mr. Curling, M. Gosselin, have shown that while section of the spermatic vessels leads to atrophy or sloughing of the testis, division of the vas deferens does not prevent the testicle from continuing to secrete and maintain its normal development for a considerable time, certainly.* Probably, this peculiarity of the testicle is due to the arrangement of its blood-supply, by which the complicated secretion of the gland is always maintained in readiness without overflowing (p. 20). It is at all events interesting to note that in none of the cases recorded in which this mal-development appeared in man, nor in any of the animals experimented on, is there any evidence of atrophy of the testicle following on engorgement and inflammation from the interference with the escape of its pent-up secretion, a fact in itself strongly confirmatory of Prof. Cleland's view above given.

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[*] Pallington, quoted by Meckel, *Handb. d. path. Anat.*, 1812, Bd. i. S. 685.

[†] *Zeitsch. der k.k. Gesellschaft d. Aertze in Wien*, t. xv. p. 42; and *Oester. Med. Jahrb.*, 1868, No. 1.

[‡] Bastien and Legendre, *Compt. rend. de la Soc. de Biologie*, 1859, p. 143; and *Gaz. Méd. de Paris*, 1859, No. 41, p. 649; Paget, *Lond. Med. Gaz.*, 1841, vol. xxix. p. 817, a preparation taken from this case is in St. Bartholomew's Hospital Museum; J. Cruveilhier, *loc. supra cit.*

[§] Ripault, *Bull. de la Soc. Anat. de Paris*, 1833, t. viii. p. 221.

[||] Blondin, *Anat. Topogr.*, 1834, 2nd ed. p. 442; Velpeau, *Traité d'Anat. Chirurg.*, 3rd ed. t. ii. p. 192.

This abnormality may attack any part of the excretory apparatus. Tracing this from before backwards, it is extremely rare for the *epididymis* alone to be deficient.† When part of the epididymis is absent, it is the head that remains. Cases where more or less of this is deficient, together with part of the *vas deferens*,‡ are more common, or the vas deferens may alone be affected.§ But if the terminal or urethral part of the vas is wanting the *vesicula seminalis* will be absent also. As above stated, Godard believed that this was the only condition under which the absence of the vesicula would be present. This authority was disposed to look upon reported cases of this absence of the vesicula as due either to arrest of development or to atrophy from pathological causes.

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* As far as I know, the longest time in which the testis thus experimentally separated from its duct remained efficient was ten months. At this time the dog, the subject of the experiment, was killed.

† Mr. Curling (*loc. supra cit.*, p. 7) mentions a specimen in St. Bartholomew's Hospital Museum, removed from a man aged fifty, in whom the testis was detained at the internal ring. The vas deferens terminated near the testicle, in a *cul de sac*. There was no trace of the epididymis. M. Godard could only find a single instance of the kind by Rhodius. According to MM. Monod and Terrillon, this case is very incompletely reported.

‡ Brugnone (*Mém. de l'Acad. Roy. des Sciences de Turin*, 1786, 1787, p. 625) records a case of absence of the epididymis (except the head) and the greater part of the vas deferens. The urethral portion alone persisted, and the vesicula seminalis was present but empty. Godard quotes a very similar case (*Recher. Tératol.*, p. 87), but here the whole of the vas deferens was wanting, and the corresponding vesicula seminalis was absent also. Three more recently reported cases are quoted by MM. Monod and Terrillon from Mündemeyer, *Zeitsch. f. Ration. Med.*, Bd. xxxiii., 1809; Reverdin, *Bull. de la Soc. Anat.*, 1870, p. 325; and Mayor, *ibid.*, 1876, p. 592.

§ Parise, *Bull. de la Soc. Anat.*, 1837, t. xii. p. 38. Godard, *loc. supra cit.* Gosselin, *Arch. Gén. de Méd.* 1847, t. xiv., p. 308, records a case in which the inguinal-scrotal portions of the vas deferens were wanting; the corresponding vesicula seminalis was here present. Prof. Turner (*Ed. Med. Journ.*, Jan. 1865) has published one in which the left testicle was retained in the abdomen, and the vas deferens was closed at its two extremities, at the one end having no connection with the epididymis, and at the other not opening into the urethra.

Cases of absence of the epididymis will be found recorded by J. Hunter, works edited by Palmer, vol. iv. p. 23.

5. **Bilateral Anorchism.**—Nearly all the above varieties of anorchism have been observed simultaneously on the two sides.[*] Thus, Fisher, of Boston (*Amer. Journ. Med. Sci.*, Philadelphia, 1838, vol. xxiii. p. 352; and *Lond. Med. Gaz.*, vol. xxviii. p. 817), and MM. Legendre and Bastien (*Compt. rend. de la Soc. de Biol.*, 1859, p. 144), have recorded cases of bilateral absence of the testicle and epididymis, each vas deferens and vesicula seminalis being intact; Godard (*Rech. Tératol.*, p. 54), one in which the testicles, epididymes, and the extra-abdominal part of the vasa deferentia were absent, the deep part of these canals and the vesiculæ seminales remaining. Absence of the entire apparatus, including the vesiculæ seminales, seems to have been met with twice, by Kretzchmar (*Arch. f. mediz. Erfährung*, Leipzig, Bd. i. S. 349) and by Friese (Casper's *Wochenscrift*, Dec. 1841; and *Brit. and For. Med.-Chir. Rev.*, vol. xiii. p. 527).

A few points relating to the different varieties of anorchism call for notice. Its extreme rarity, especially when bilateral, is shown by Gruber, Professor of Anatomy in St. Petersburg. Writing in 1868, he could only collect twenty-three cases of unilateral anorchism, and seven of the bilateral variety, all having been verified by autopsy. Very few have been added since. The left side seems to be somewhat more frequently the site of the deficiency, both in the case of the testicle and in that of its excretory apparatus.

Co-existing Malformations.—(1) **State of external genitals.**—(*a*) **When the abnormality is unilateral**, the corresponding half of the scrotum is usually present, but smooth and ill-developed. The raphè is present. The above asymmetry is the more marked in proportion as more and more of the excretory apparatus is wanting also.[†] The opposite testicle may be normal, it may be hypertrophied, or it may be ectopic.

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[*] According to MM. Monod and Terrillon, the only one of the above varieties which has not been met with on both sides is that in which the testicle itself alone is absent.

[†] According to Godard, in complete anorchism—*i.e.*, when the testis and its excretory apparatus is entirely absent—the layers of the scrotum consist only of

(β) **When the anorchism is bilateral** the external genitals are usually present, but in an extremely rudimentary condition. In exceptional cases—*e.g.*, that of Friese (*loc. supra cit.*)—the external genitals were entirely wanting, and in that of Godard (*Rech. Tératol.*, p. 54) the scrotum was wanting. (2) **Other malformations outside the genitals.**—With the exception of the urinary organs, these would appear to be rare. As might be expected from the intimate connection which exists in early fœtal life, by means of the Wolffian bodies, between the urinary and the generative organs, this exception is readily explained.

In many of the cases above quoted, malformation or absence of the kidney and ureter was found on the same side as the unilateral anorchism. Where the anorchism is bilateral, the co-existing malformations have been of a graver kind—*e.g.*, the rectum imperforate, the bowel opening into the bladder or the urethra.

Influence of Anorchism on the Sexual Function and on the Bodily Physique and Mental Powers.—In unilateral anorchism the above are unaffected, if the opposite testicle be normal in position and healthy in structure. But if the anorchism be double, the patient is not only sterile, but, owing to the ill-development of the genitals, impotent also.* In many other points—the entire loss of energy, the mental apathy, the puerile, cracked voice, the scanty development of hair—these natural eunuchs closely resemble those who have been made so early in life.

The above point, that anorchids are naturally eunuchs, has been put forward as a means of diagnosis between anorchids and cryptorchids—*i.e.*, the subjects of abdominal and iliac retention of the testicles. Thus Godard (*Rech. Tératol.*, p. 58) held that cryptorchids would be capable of sexual intercourse, though the fluid

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thin superficial fascia and cellulo-fatty tissue. When the vas deferens is present some cremasteric fibres and a tunica vaginalis more or less rudimentary show a further effort at development.

* One case, that of Cabrolius (*Alphabeton Anatomicon*, p. 86), has been quoted to show that the subjects of double anorchism are not necessarily impotent. On examination of the body of a soldier who had been hanged for an attempt at violation, no testicles could be found, the vesicula seminalis being stated to be as full of semen as in any body that Cabrolius had ever dissected. Owing to its date, the indefiniteness with which some important points are reported, this case, standing as it does alone, cannot be allowed to set aside the above opinion, which is based on many cases and on common sense as well; nor does it prove that the presence of the vesiculæ seminales, and the secretion which they furnish, is sufficient to prevent impotence.

ejaculated would be unfertile, but that anorchids would be impotent and incapable of any ejaculation. MM. Monod and Terrillon (*loc. supra cit.*, p. 19) hold that this is going too far, as some cryptorchids are quite as impotent, quite as feminine in aspect, as the anorchids mentioned above. A correct diagnosis must, therefore, be sometimes impossible during life. This subject is again alluded to at p. 45.

SECTION II.

ABNORMALITIES IN THE TRANSIT OF THE TESTICLE.

A. **Incomplete Transit of the Testis. Retention of the Testis.** B. **Malplaced Transit**, or **Ectopia of the Testis.**—These abnormalities, being more common, are of much greater practical importance than the preceding.

Definition.—It will be suitable here to define clearly the very varying terms which have been used synonymously, and somewhat loosely, for very different conditions.

Anorchism, with the prefix single or bilateral, should be kept for those cases in which one or both testicles, or their annexa, are absent (p. 23). **Monorchism** is the simple equivalent of single anorchism. **Cryptorchism**, single or double, should be retained for those cases in which one or both testicles, though present, are hidden out of sight. This term is therefore the equivalent of abdominal or iliac retention of the testis (*vide infra*). **Ectopia of the testicle** should, for accuracy and convenience of description, include the following varieties:

(α) Incompleted normal descent of the testicle, or retention of the testicle, and (β) abnormal descent of the testicle, or ectopia testis.

These abnormalities are of much greater practical importance than the preceding. **Frequency.**—I believe this to be greater than is usually allowed. The well-known statistics of Wrisberg (*Comment. Soc. Reg. Scient. Goett*, 1778)—in which in 103 male infants examined at birth, 73 had both testicles in the scrotum; in 21, one or both were in the groin; in 9, one or both were in the abdomen—are fallacious, as at this early age the testicle has frequently not completed its descent, and the retention is thus in many cases only temporary. The above proportion is therefore too high. On the other hand, the statistics taken from a large number of recruits, and therefore from healthy and otherwise well-developed adults, do not give a sufficiently large number of cases to be reliable. Thus, in Marshall's* cases, 11 cases of ectopia were found in 10,800 cases. In the first six months of 1891 I saw no fewer than 7 cases, 6 of which were operated on, and are recorded below.

Unilateral retention is far more common than the bilateral form. Marshall (*loc. supra cit.*) had only seen one instance of this. M. Rennes (*vide infra*) had not met with one. I have only met with a single case, one of bilateral inguinal retention (p. 82). **Side affected.**—When a comparatively small number of cases are taken, the imperfection appears to be somewhat more frequent on the left side; but when a larger number are taken, the difference between the two sides is very slight.† This question is not one of importance.

A. **Uncompleted Normal Transit of the Testicle. Retention of the Testicle.**—Instead of reaching the scrotum, the testis may never leave its original home, or, after starting, it may be arrested at almost any point of its normal course. The following are **the chief varieties**:—(1) **Retentio abdominalis.** The testicle here either remains on the posterior wall of the abdomen, or floats freely within the peritoneal cavity. (2) **Retentio iliaca.** Here the testis is retained in the iliac fossa, near the internal abdominal ring. (3) **Retentio inguinalis.** Here the inguinal canal is the seat of the retention. (4) **Retentio cruro-scrotalis.** Here the testicle is arrested in the fold between the scrotum and the thigh. Each must be described separately. It must always be remembered that in several cases the retention may vary. Thus, a testicle at one time may be in the iliac fossa, at another in the inguinal canal. In another case, the retention at one time may be inguinal, at another cruro-scrotal. Furthermore, while for convenience and accuracy it is well to have the above defined varieties, occasionally the testicle may occupy a osition transitional between two of them. Thus, a testicle may e partly in the iliac fossa, and partly in the inguinal canal.

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* *Hints to Young Medical Officers in the Army on the Examination of Recruits, &c.*, London, 1828; *Edin. Med. and Surg. Journ.*, 1828, vol. xxx. p. 172. M. Rennes (*Arch. Gén. de Méd.*, 1831, t. xxvi. p. 360, and t. xxvii. p. 24) found 6 cases of ectopia in 3600 French conscripts. MM. Trélat and Peyrot show that the proportion given by Marshall, though much lower than that of M. Rennes, is still considerable, and would give a proportion of 1000 cases of ectopia in a city of two million inhabitants such as Paris.

† Thus, in 36 cases collected by M. Godard, the right side was affected in 14, and the left in 22. Dr. Le Dentu (*Des Anom. de Testic.*, p. 74) having collected 72 cases from several writers, found 38 on the right side, and 34 on the left.

Finally, some of these varieties of retained testis must be urther classified according to the relations of the testis and pididymis and vas deferens. Thus, there are cases (*α*) in which he testis retained in the abdomen or the inguinal canal maintains ts normal relations with the epididymis or vas deferens, the corre-ponding side of the scrotum being often undeveloped. (*β*) Cases n which the testicle is retained in the iliac or inguinal regions, vhile the epididymis and vas deferens are found to have passed n in front of it towards or into the scrotum.* In other words, he obstacle which stops the testis is not sufficient to arrest the pididymis and vas deferens. As pointed out by M. Follin (*loc. upra cit.* p. 270), the explanation of these cases is easy where he obstacle consists of a narrowing of the external ring, as this arrowing may be sufficient to arrest the testis, but not the epi-idymis, "constantly solicited to descend by the all-powerful action f gravity."

Relative Frequency of the Chief Varieties.—We want more ccurate information from a large number of cases. There is no oubt, however, that inguinal retention, and with this its sub-ariety, the cruro-scrotal, is by far the most common, probably wice as frequent as all the other varieties put together, and that ext to this, but infinitely less frequent, comes the iliac variety. t must always be remembered in drawing up statistics on this oint, (1) that iliac retention may easily be overlooked, and (2) that he cruro-scrotal variety can easily be confused with the inguinal.

Varieties.—(1) Abdominal Retention.—Here the testicle is ither fixed to the posterior wall of the abdomen, close to the idney, in its earliest home, or floats freely in the cavity of the bdomen. This depends on the length of the mesorchium. A case given at p. 43. The mesorchium is a double fold of peri-onæum united behind the testicle; in some cases short, and tying he testis down, in others of varying length, and giving the estis more or less mobility. This very mobility may hinder the ntrance of the testis into the inguinal canal.

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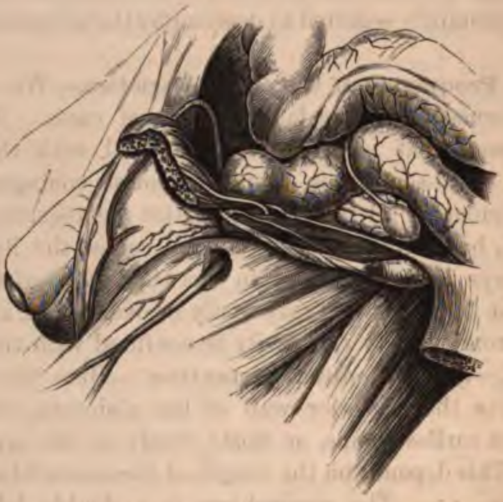
* After descending a varying distance towards the bottom of the scrotum, the as deferens ascends again through the inguinal canal, to follow its ordinary ourse. M. Follin (*loc. supra cit.*, p. 270) mentions a case where epididymitis had eveloped in a testicle retained in the inguinal canal. The inflammation had ndered very distinct a tube, hard, resistant, and painful, which descended below e testis towards the scrotum; it was the swollen epididymis.

(2) **Iliac Retention.**—Here the testis is retained in one of the iliac fossæ, in the neighbourhood of the internal abdominal ring. By many writers, especially the French, this variety is included with the abdominal. It seems, however, justifiable to separate them, as the iliac is more likely to lend itself to successful operation than the abdominal, owing to the greater facility with which a testicle thus placed near the internal abdominal ring can be seized and brought down. A case of this kind is related at p. 79.

The following account of a case of iliac retention (Fig. 4) has been given by Mr. J. Wood (*Path. Soc. Trans.*, vol. viii. p. 265, Pl. iii. Fig. 3). The patient was between forty and fifty. The right testicle was in the scrotum, and double its natural size. The left side of the scrotum was empty, the testicle being found, on opening the belly, to be lying in the left iliac fossa between the sigmoid flexure of the colon and the internal ring. It was only one-third its proper size. The globus minor of the epididymis passed for about half an inch through the internal abdominal ring; connected with it in the usual manner, and also engaged in the orifice of the ring, was the vas deferens, of the normal calibre and appearance. Passing from the globus major, at its junction with the testicle, to the mesenteric border of the sigmoid, were three

FIG. 4.

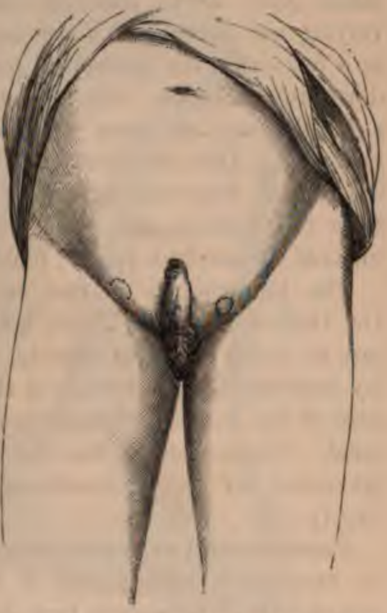


Iliac retention of testicle with adhesions uniting it to the sigmoid flexure. (Wood.)

very distinct transparent bands of adhesion. In many of the mesenteric glands were found chalky concretions like the *débris* of tubercle. No adhesions were found in any other part of the peritonæum. Mr. Wood considered that the above pointed to local inflammation, due to mesenteric disease in fœtal life or early infancy, with formation of adhesions, and arrest of the descent of the gland at the utmost stretch of the adhesive bands.

(3) **Inguinal Retention** (Fig. 5).—This is the most important variety, as being the most common (*vide supra*), and as it is in this position that the testis is most exposed to injury and irritation, and their results. Any part of the canal may be occupied by the testis; thus the retention is divided into (*α*) internal inguinal, when the testicle is situated at the internal abdominal ring, (*β*) interstitial, when it occupies the canal itself, and (*γ*) external inguinal, when it lies at the external ring. The interstitial position just above the external ring is the most frequent. The above classification is of some importance as it has been shown by M. Gosselin, that, in the interstitial variety, the anterior wall of the canal, including the aponeurosis of the external oblique may be remarkably thinned; so much so, that the testis may appear subcutaneous, and coming to occupy the upper part of Scarpa's triangle may be mistaken for a femoral hernia. In some cases, as in one of M. Godard's, especially when the pressure of a truss has been constantly applied, it is the posterior wall—which is so depressed as to form a pouch behind the crural arch—in which a hernia may become strangulated.

Fig. 5.



Inguinal retention, on both sides, in a boy aged twelve; interstitial sub-variety. The dotted lines indicate the position of the testes. The left is a little lower than the right. The scrotum is ill-developed. (Osborn.)

In inguinal retention the testicle, in early life, possesses much mobility, being readily pressed up into the abdomen and at once returning. In other cases the testicle only enters the canal when the patient is standing. As life goes on, the testicle is liable to become more and more fixed by recurrent inflammation.

The relation of the peritonæum to the retained testis is varying and of great importance. In some cases, which are not uncommon, especially when a truss has been worn, or any irritation has been present, obliteration of the peritonæal process has taken place. In others, it is open and readily predisposes to hernia or to the ascent of inflammation, which may be fatal, as in the case at p. 62. In a third set of cases, the obliteration may have taken place above the internal ring, leaving a serous sac of varying size below, which may be the seat of hydrocele. Finally, in a few cases, the peritonæal process may remain open, not only down to but beyond the retained testis into the scrotum; here a hernia may at times descend, at others returning into the abdomen. This condition of the peritonæum is also present in those cases where the epididymis and vas deferens are displaced from the testicle, and project beyond it to a varying extent towards the scrotum (p. 31, footnote).

The following is a rare sub-variety of inguinal retention. Dr. Gruber (Virchow, *Arch.*, Bd. lxxiii. S. 332) has described a case in which the right testicle, the subject of inguinal retention, lay between the aponeurosis of the external oblique and the lower edge of the internal oblique in the anterior wall of the inguinal canal. He considered that the further descent in this case was prevented by the extraordinary narrowness of the external ring (p. 39).

Cruro-Scrotal or **Scroto-Femoral Retention.**—This is not* an uncommon variety, and is liable to be confused with the preceding.† The testicle here, having passed the inguinal canal, is arrested in the fold between the scrotum and the thigh, just below or at a varying distance from the external abdominal ring.

B. **Malplaced Transition** or **Ectopia Testis.**—Of this there are **two chief varieties.** In one, the testicle traverses the inguinal canal, and then, instead of going on into the scrotum, travels into the perinæum—**Ectopia perinæalis.** In the other, the testicle leaves the peritonæal cavity by an altogether different route, viz., the crural ring—**Ectopia cruralis.** There is a third, but infinitely rare, variety—the **peno-pubic**—in which the testis is situated at the root of the penis, in front of the pubes.

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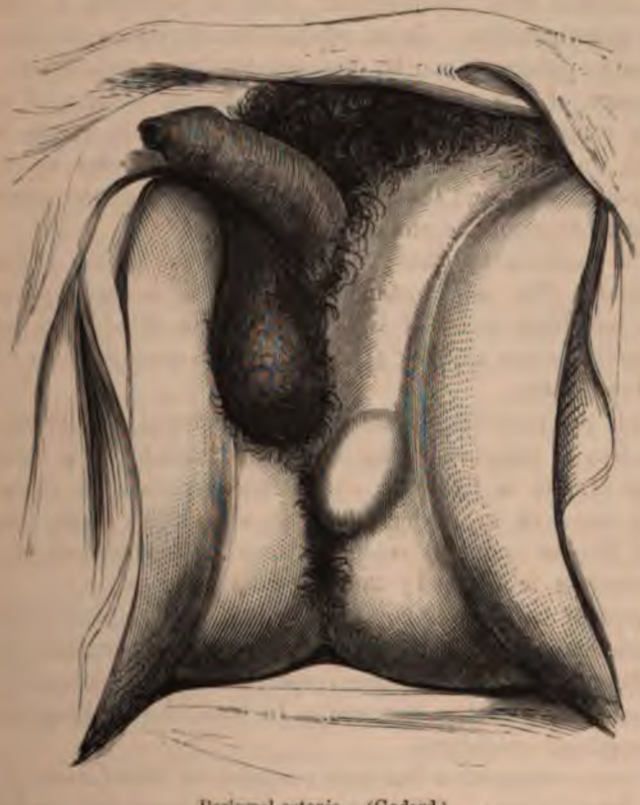
* Dr. Englisch (*Wien. Klinik*, 1886) shares this view. According to him, this variety is the commonest form of displaced testicle, and liable to be overlooked. He believes that both this and the perinæal variety of ectopia are due to delay in the transition of the testicle; the scrotum is thus imperfectly developed, and too small to receive the testicle.

† This seems to have been the case with regard to the instance of misplaced testicle published by Dr. Flanagan (*Brit. Med. Journ.*, 1884, vol. i. p. 7). It is described as having been in perinæo, but from the drawing it seems to have been well to the side of the perinæum, and cruro-scrotal in variety.

FIG. 6.



Perinæal ectopia. (Godard.)

(1) **Ectopia Perinæalis** (Fig. 6).—Passage of the testicle into the perinæum. This is much the most common of the two varieties of ectopia. The testis here occupies a position in advance of the cruro-scrotal variety. It causes a distinct oval elevation just in front of the anus, close to the raphè, and usually on the left side. It occupies a pouch, which is usually beneath the deep layer of superficial fascia,* and is surrounded by its tunica vaginalis.

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* According to Mr. Osborn, *Lancet*, July 13, 1878, a testicle, the subject of

The skin over it is usually free from rugæ—more rarely it is rugose—the dartos being absent.* The scrotum on the corresponding side is often, but not always, undeveloped. The cord can be traced down to along the outer side of the scrotum, and can usually be felt running up along the cruro-scrotal fold to the external abdominal ring. In some cases, a band can be felt subcutaneously, which causes the mobile testis to return when shifted from its position. This is probably a remnant of the gubernaculum. In an adult, as the coverings are thin, the testis and epididymis can be distinguished from each other.

Passage of the testis into the perinæum though, of course, usually congenital, is not invariably so. Thus, in a case of M. Godard, the testis remained in the inguinal canal up to the twenty-fifth year, and then gradually travelled into the perinæum, lodging in front of the anus.

It is noteworthy that this condition is almost invariably unilateral. The only instance of bilateral ectopia perinæalis which has been recorded is, I believe, one alluded to by Mr. Curling (*loc. supra cit.*, p. 53) as having been mentioned to him by Mr. Hutchinson.

While in early life a testicle thus misplaced readily slips out of the way of pressure, owing to its great mobility,† in later life it must always be liable to cause inconvenience, as in sudden sitting down or in riding. That it also, like a testis, the subject of iliac or inguinal retention, may be the subject of acute inflammation, is shown by the following case :—

A patient with gonorrhœa, complained of a painful swelling in the perinæum; M. Ricord, supposing it to be a perinæal abscess, was about to open it, but discovered that it was the testicle. He had met with a similar instance. In both, the swelling was due to gonorrhœal epididymis.

A rarer complication has been recorded by Zeis (*Arch. f. Clin. Chir.*, Bd. ii. S. 81). When about to operate on a lad, aged fifteen, for stone in the bladder, he found the left testicle in the way of

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perinæal ectopia, sometimes lies between the two layers of the superficial fascia. There is no sufficient evidence to hand as to the relation of a perinæal testicle to the peritonæal process. From an examination of the cases, I think that usually the funicular process is obliterated; thus, there is a distinct tunica vaginalis, any operation being thus simplified.

* The presence of the dartos, to which the rugæ are due, may perhaps be made out by sprinkling a little cold water on the part.

† This always lessens as adult life is reached.

his intended incision, and he accordingly cut on the other side. Nowadays, the supra-pubic operation or litholapaxy would suggest themselves.

Explanation of Perinæal Ectopia.—This malposition of the testicle has been usually attributed to a faulty insertion of the middle fasciculus of the gubernaculum (p. 40). This, instead of being inserted at the bottom of the scrotum, is attached to the subcutaneous tissues of the perinæum. This view receives support from the fact that, in several of these cases which have been submitted to operation, before the testicle could be freed from its abnormal site and placed in the scrotum, a band had to be divided which appeared to correspond to a fasciculus of the gubernaculum. Others—*e.g.*, Mr. Lockwood (*vide infra*, p. 41)—look upon this perinæal band as normal and the most potent of the different fasciculi of the gubernaculum in directing the testicle into the scrotum.

(2) **Ectopia Cruralis.**—Displacement of the testicle through the crural ring. This form of ectopia is extremely rare. The testis passes under Poupart's ligament, through the crural ring, in exactly the same way as a femoral hernia; occasionally like a large hernia in this region, mounting up along Poupart's ligament. As in other cases of misplaced or retained testis inflammation may supervene, closely simulating strangulated femoral hernia. In some cases, a femoral hernia has accompanied a testicle thus misplaced. Finally, the testicle, like the ovary, may be found within a femoral hernia.

Diagnosis.—The emptiness of the corresponding half of the scrotum, the shape, peculiar tenderness, the mobility of the femoral swelling, will usually prevent its being confused with the other swellings most likely to be met with here—viz., a gland, an omental femoral hernia, and a varix of the saphenous vein.

An interesting instance of this variety was brought before the Hunterian Society by Dr. W. Fowler (*Lancet*, 1890, vol. i. p. 909). The patient was seventeen. Over the left saphenous opening was a superficial fluctuating swelling about the size of a split Tangerine orange, at the lower part of which the testicle and cord could be felt. Above the swelling was an ill-defined fulness, reaching up to Poupart's ligament. Here alone there was very slight impulse on coughing. In the recumbent position a certain amount of fluid could be displaced from the swelling into the fulness above it, as though the processus vaginalis was not obliterated. The displaced testicle was small, tender, and possessed testicular sensation. The swelling had been noticed about ten years, lessening in size when the patient lay down. The patient had worn a truss, in the belief that the swelling was a hernia. The only inconvenience was some aching in the part, especially after exertion.

The following cases of this interesting but rare abnormality are recorded by Mr. Curling (*loc. supra cit.*, p. 57). M. Guincourt gives (*Journ. de Méd.*, t. xvii., Janvier, 1809) the case of a young man, who, at the age of seventeen, pressed his left testicle back into the abdomen. Ten years later he was attacked with symptoms resembling and mistaken for strangulated hernia, a considerable swelling being discovered in the left groin. After unsuccessful attempts at taxis, an operation was performed, when the swelling was found to consist of the testicle only, which had escaped by the crural ring. Poupart's ligament was divided, after which the testicle returned gradually into the abdomen, and the patient recovered. Vidal also relates (*Path. Ext.*, 2nd edit., vol. v. p. 431) a case in which a testicle, instead of leaving the abdomen by the inguinal canal, made its exit at the crural ring. The organ mounted upon the abdomen like a femoral hernia. A portion of intestine traversed the inguinal canal on the same side. This abnormality was met with in a subject in the dissecting room of the London Hospital. The right testicle was small and undeveloped, and was lodged in the upper and inner part of the thigh, about three inches below Poupart's ligament. It was found behind the saphena vein, in the opening in the fascia lata; the cord, which was long, encircling the vein. The right half of the scrotum was deficient. Mr. Curling met with only one case in the living subject. The patient was a healthy-looking boy, eight years of age. An oval swelling, the size of a pigeon's egg, was situated obliquely in the left groin, immediately below Poupart's ligament, and over the crural ring. The swelling was tolerably firm and elastic when the boy was in the upright position, but it became softer when he was recumbent, and a small solid substance could then be detected in it, but it was not possible to push this back into the abdomen. The left side of the scrotum was small and empty.

(3) **Pubo-penile Ectopia.**—This variety is the rarest of all. The only instances with which I am acquainted are cases of Dr. W. Popow, of St. Petersburg (*Bull. de la Soc. Anat.*, 1888, p. 653). In one, the left testicle was situated at the root of the

penis, in front of the pubes. The epididymis and cord could be made out. The testicle preserved its especial testicular sensation and was not atrophied. Dr. Popow knew of one other case, at Moscow, in which the right testicle was thus displaced. He explained it by probable atrophy of the external and scrotal fasciculi of the gubernaculum, the internal fasciculus alone remaining.

Causes of Retention of the Testicle.—These must remain uncertain until the means by which the normal transition of the testis is affected are fully known. Many of the following are ingenious guesses rather than well-established facts. (1) **Intra-uterine peritonitis.*** It is thought that, as a result of this, adhesions may form and prevent the descent of the testicle. Mr. Curling (*loc. supra cit.*, p. 23) has collected several such instances in which adhesions, often multiple, have existed between the testis and the sigmoid flexure, the cæcum, and omentum. One of the best cases of this kind is the one of Mr. Wood's, already quoted at p. 32, in which the left testis was in the iliac fossa, three very distinct bands of adhesion passing between it and the sigmoid flexure (Fig. 4).

(2) **Small Size or Contracted Condition of the External Abdominal Ring.**—Mr. Curling considered that the fact that the testis is oftener found in the lower part of the inguinal canal than in the cavity of the abdomen, makes the above condition a probable cause of incomplete descent of the testis. The same opinion is thus expressed by Prof. Richet:—"L'ectopie testiculaire inguinale, est, sans contredit, de toutes la plus fréquente—ou la trouvé dans tous les points du canal inguinal; le plus fréquemment il s'arrête à l'anneau externe, retenu par des bandellettes aponeurotiques qui circonscrivent cette ouverture." Prof. Grüber, of St. Petersburg (Virchow, *Arch.*, Bd. lxiii. S. 332), considered that the explanation of a case of inguinal retention lay in the extraordinary narrowness of the external ring. Thus, "der rechte Annulus externus ist abnorm gefonnt und besonders abnorm klein"; later on, he speaks of "die ausserordentlieche Enge der Annulus externus."

The following case seems to have been a more advanced degree of the above condition. It occurred in the practice of M. le Dr. Roy des Barres (*Bull. de la Soc. Anat.*, 1884, vol. ix. p. 654).

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* Sir J. Simpson (*Edin. Med. and Surg. Journ.*, vols. l. and lii.) discusses the influence of intra-uterine peritonitis in producing certain congenital hernia, malformations of the abdominal viscera, &c.

The patient, aged twenty-six, had had a left inguinal hernia from his infancy. The left testicle could be felt at the lower part of the inguinal canal. During a strain, the hernia became larger and irreducible. Taxis, under chloroform, partly reduced the swelling. Symptoms of obstruction continued, and at the operation, before the constricting agent* could be removed, it was necessary to cut through the skin, superficial fascia, and external oblique. Death took place from asphyxia due to vomiting. The hernia had passed through the internal abdominal ring, and occupied the lower part of the inguinal canal, which in this case had no external orifice.

(3) **Ill-development of the Inguinal Canal.**—In the case given at p. 79, in which M. Quelliot succeeded in bringing down into the scrotum a testicle the subject of iliac retention, the cause of this abnormality was thought to have been deficiency of the upper part of the inguinal canal.

The objection to the second, and, perhaps, the third also, of the above causes is an obvious one. This non-development of the inguinal canal, or of the external abdominal ring, is quite as likely to be a consequence as a cause of the retention, according to the well-known law by which functionless parts tend to atrophy and disappear.

(4) **Absence or Malposition of one or more of the upper or lower Attachments of the Gubernaculum.**—This, as a cause of retention, rests on a firmer basis than many of the others here given. Strongly put forward by Mr. Curling, it has received much support from cases like that of the fœtus examined by Mr. Lockwood. Here the non-transition of the gland was considered to be due to an absence of the upper normal attachments of the gubernaculum, which structure, instead of being fastened to the testis, epididymis, and vas deferens, ended in a brush of fibres spread out in a fold of peritonæum (Fig. 7). In cases of ectopia, especially the perinæal form, an abnormal development of the perinæal fasciculus, which is attached to the tuber ischii, or blends with the sphincter ani, has long been supposed to be the explanation of the abnormality. Thus, Mr. J. E. Adams (*Lancet*, May 27, 1871) found, when operating on a child of eleven months, the subject of perinæal ectopia, that on making traction upwards on the cord there was some firm adhesion between the lower part of the testicle and the

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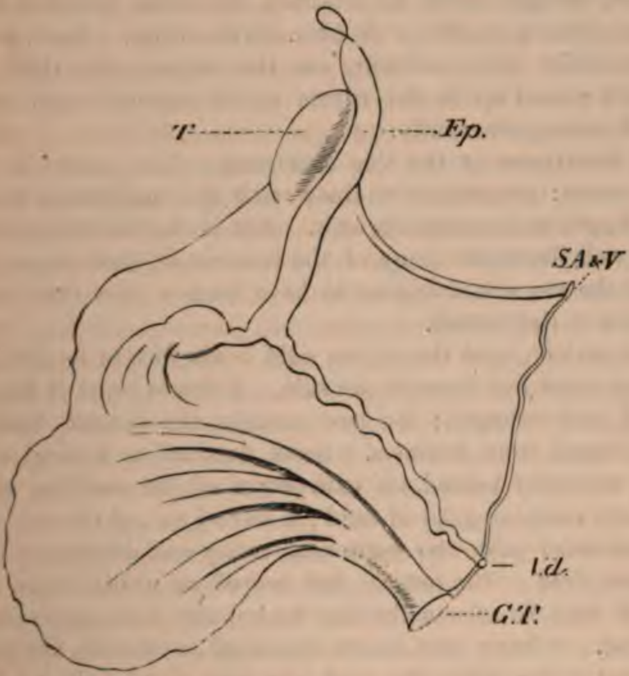
* The nature of this is not stated.

perinæal pouch. This band has been found in many other cases, both before and during operation (Osborn, *Lancet*, July 13, 1878). By most, this fasciculus has been considered abnormal. Another view is that of Mr. Lockwood, who looks upon it as normal, and as the most powerful means by which the testicle is brought into the scrotum. At p. 39 will be found a case in which it was thought that over-contraction of another fasciculus of the gubernaculum—this time, the most internal one—attached to the pubes was the means of bringing the testicle into a pubo-penile ectopia.

FIG. 7.



T, Testicle. *Ep.*, Epididymis. *SA & V*, Spermatic artery and Vein. *Vd*, Vas deferens. *GT*, Gubernaculum testis, ending faultily. (Lockwood.)

(5) **Action of the Cremaster.**—This may be the cause of a testicle which has passed normally into the scrotum being drawn up and retained temporarily or permanently. An instance of the former is given by Szymanowski, in which one testis, every time a sound was passed into the urethra, was drawn by violent contractions of the cremaster within the external abdominal ring, though this was undilated by any hernia, old or recent. The following are instances of permanent retention. In the *Med.*

Times and Gazette, vol. xviii. p. 67, will be found the case where the right testis was suddenly and violently drawn up into the inguinal (probably by excited action of the cremaster) canal during masturbation, when the patient was young, and never reappeared.* The case I have quoted at p. 87 is a similar one. Another instance, brought about by a strain, has been recorded by M. Cintrac (*Recueil de Méd. et de Chir. Milit.*, 1863). Here, while a young soldier was exercising on the trapeze, the right testis suddenly passed up to the centre of the inguinal canal, and remained there permanently.

(6) **Shortness of the Vas Deferens.**—This cannot be a frequent cause: as a rule, in retained testis the vas deferens is of the usual length and arranged in coils. But in the following instance, which well illustrates many of the features of these cases, shortness of the vas would appear to have been a *vera causa* of the retention of the testicle.

In a patient, aged thirty, the right testis was to be felt in the inguinal canal just beneath the skin. For two years it had been painful and enlarged; for two months the patient had been incapacitated from business. Some fluctuation noticed at the upper extremity proved, on extirpation of the swelling, to be a hydrocele containing ℥ij of fluid; a second sac, at the other end, communicated with the peritoneal cavity and discharged ℥xxxij of serous fluid. The testicle had served as a ball-valve to the internal ring so effectually that no impulse was perceptible on coughing. After a very severe attack of peritonitis, the patient recovered. The spermatic cord was very short, only 1¾ inches long. It was not indurated, nor had it any adhesions, and when divided it was perceptibly contractile (*Amer. Journ. Med. Sci.*, vol. lvii. p. 100).

(7) **Shortness of the Vessels.**—Mr. Godlee (*Med. Times and Gaz.*, Oct. 13, 1883) reports a case of strangulated undescended testicle, in which, during operation, attempts to get the testicle into the scrotum failed on account of the shortness of the vessels, and not from any deficiency in length of the vas deferens.

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* This patient dying after an operation for a strangulated femoral hernia, the right testicle was discovered lying in the inguinal canal, a small part of it emerging through the ring. It was only about ⅓ of the size of its fellow, soft and pulpy. The corresponding vesicula seminalis was also very small, and contained but little seminal fluid, sufficient, however, to show that the testicle had performed its function, though in a limited degree. The vas deferens was almost as large as its fellow. M. Langier considered that the presence of semen in the vesicula seminalis was due to a small part of the testicle having escaped pressure.

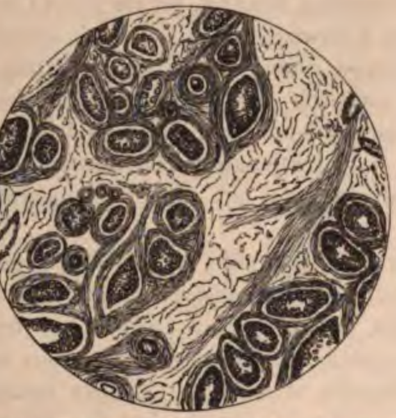
(8) **Abnormal Size of the Epididymis.**—Kocher considers this to be a possible cause, and figures an instance (*loc. supra cit.*, p. 416, fig. 84) from a preparation in the museum at Zurich. The testis here, small, pear-shaped, and lying just within the internal abdominal ring, is surmounted by a huge helmet-shaped epididymis, out of all proportion to it.

(9) **A Long Mesorchium.**—This, by keeping the testicle loose or floating, may prevent it from entering the inguinal canal. The following case (Hulke, *Med.-Chir. Soc. Trans.*, vol. xlix. p. 189) probably shows that the free suspension of a testicle by a long mesorchium may prevent its transit:

Bi-lateral Oblique Inguinal Hernia. Abdominal Retention of Testes. Hernial Sacs descending into Scrotum, and also ascending upon the Aponeurosis of the External Oblique. One Hernia Strangulated. Peritonitis. Operation. Death from Persistent Peritonitis.—Patient, aged twenty-seven, admitted into the Middlesex Hospital with strangulated hernia. The right side of the scrotum was distended by a large globular swelling, which stretched upwards along the groin to the anterior superior spine. The inguinal and scrotal parts, though separated by an intermediate narrow portion, proved to belong to a common cavity. Except at its pubic end, the inguinal portion was accurately definable—the finger-tips could be slipped under its edge—making it evident that it was superficial to the external oblique. In the left groin there was a similarly superficial swelling, of like extent; it was flaccid and contained omentum. Pus oozed from the urethra. Neither testis could be felt in the scrotum or groin. The patient evidently had acute peritonitis. His extreme suffering made him so impatient of questions, that it could only be elicited that he had been ruptured since childhood, and that each rupture had been reducible until that morning. The nature of the left hernia was probably an ordinary oblique inguinal, which had deviated from the usual course owing to the non-development of the scrotum connected with the arrested transit of the testicle. But the nature of the right and strangulated hernia was not so evident. Supposing the testis was in the scrotum, its concealment was consistent with congenital hernia, and, if inflamed and swollen (the patient had gonorrhœa), the testis by pre-occupying the scrotum might have hindered the descent of the intestine, and in this way led to the formation of a superficial diverticulum in the groin. An incision over the external ring exposed a sac as thin and transparent as gauze, and containing several feet of gut men of semen examined from this patient contained a large amount of spermatozoa.

Another case has been recorded by M. Valette,* in which spermatozoa were found in the vas deferens of a testis retained in the inguinal canal, and removed at the desire of the patient on account of severe and repeated suffering. The patient was here aged thirty-three, and as there had been several attacks of inflammation it is not surprising to find that the spermatozoa found were few and quite immobile. It was thought that this condition of the spermatozoa was of long standing. No marked alteration was found in the parenchyma of the testicle. The above cases show that up to a certain age a testicle, though not in its proper place, may be capable of secreting "normal spermatozoa." Later on, however, when the misplacement has continued longer, the condition of things is changed, degeneration of the testicle follows. This has been well proved by MM. Monod and Arthaud (*Arch. Gén. de Méd.*, 1887). In a testicle which had been retained in the groin, removed from a young man of about twenty, to whom the retention had given little or no trouble, the parenchyma was almost absolutely unaltered, and spermatogenesis was not suspended. In two other cases, obtained from men over forty (Figs. 8 and 9), the misplacement was of long standing; the testicles, notably diminished in size, presented the following essential alterations—viz., (1) a perivascular sclerosis starting in the body of Highmore, the connective tissue of which, according to the above writers, thickens, indurates, destroys the ducts which cross it, and suppresses all communication between the gland and its excretory passages; (2) a pericanicular sclerosis obliterating the lumen of the ducts and leading to a gradual and progressive diminution of the

FIG. 8.



The intertubular connective tissue is almost normal. Some of the seminal tubules show epithelium in the course of alteration. (Monod and Arthaud.)

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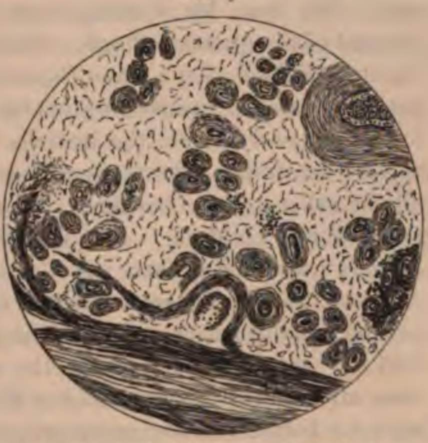
* *Lyon Méd.*, 1869; Le Dentu, *Anom. du Testicule*, Paris, 1869.

epithelium, and (3) a mucoid and fatty degeneration of the spermatic cells. The above writers recognise three stages in the process. (1) An early one, in which spermatogenesis and the excretion of semen are carried on, as in the normal state. (2) In the second period, the gland preserves its function of formation of semen, but perivascular sclerosis and induration of the body of Highmore bring about obstruction to the excretion of the products of secretion, and hence comes infecundity without atrophy. (3) Finally there supervenes, as a consequence of the obliteration of the excretory passages, pericanicular sclerosis and atrophy *en masse* of the gland, characterised by proliferation of the connective tissue and progressive disappearance of the epithelium by a mechanism allied to that of old age.

FIG. 9.



An artery attacked by endo-periarteritis is seen above and to the right. The intertubular connective-tissue is a little increased. The seminal tubules are sclerosed and atrophied. Below, the thickened tunica vaginalis is seen. (Monod and Arthaud.)

The above fact, that a misplaced testicle is healthy and functional at first, and only becomes degenerate and sterile after a time, according to the pressure and irritation to which it has been subjected, accounts for much of the dispute which has taken place as to the sterility of patients thus affected. Mr. Curling (*loc. supra cit.*, pp. 38, 467) puts forward his opinion strongly, based upon evidence derived from man and the lower animals, that a misplaced testicle usually fails to secrete a fertilising fluid, and that a male with this defect on both sides, though often efficient for sexual intercourse, is very rarely capable of impregnating the female. He supported this opinion by six cases, in which the testicles had not descended into the scrotum, in all of which the patients were sterile, and in which the fluid emitted after intercourse or after nocturnal emissions was found to be wanting in spermatozoa. Passing over the fact that fluid thus brought for examination is not entirely satisfactory, it is noteworthy that in four of Mr. Curling's six cases, the ages were, at the time of his examination, 38, 30, 46, and 39. The ages of the other two were 21 and 19. Mr. Curling was inclined to go further, and with regard to cases which have been recorded comparatively recently, in which subjects of retained or misplaced testicles had married and begotten children, he rejected the claims to paternity in these cases, and suggested that the impregnation of the wife was due to another source than the legitimate one. But here Mr. Curling does not seem to have taken due account of the question of age. Thus, in one of the cases which he rejected (Poland, *Guy's Hosp. Reports*, 2nd series, vol. i. p. 162), the patient was aged twenty-nine when admitted into Guy's Hospital for an omental hernia, the testicles had not descended, and there was no scrotum. The penis was well developed, the patient had all the other signs of virility. He married when he was twenty, and had two children. It is quite clear that this case, like Dr. Beigel's (*supra cit.*), bears out the opinion of MM. Monod and Arthaud, that in the earlier stages of retention a testicle may yet be functionally active. Mr. Curling's objection would presuppose that the wives of five patients, the subjects of misplaced testicles, were all unfaithful, a coincidence which would fit in very happily with his belief, but the assumption of which seems to me to be scarcely justifiable. For it should be noted that these men were undoubtedly capable of sexual intercourse, and could thus have given no ground of complaint to their wives, or supposed excuse for unfaithfulness.

Both sides of this question have now been considered. It is obviously one of considerable importance to the medical man, whose opinion may be sought in medico-legal cases involving paternity, and also by patients as to the advisability of marriage. To take the latter instance, where a patient has all the external characters of virility, where the sexual desires are strong, where he is under thirty, and gives no history of inflammation of the testicles which may have altered their structure, the surgeon should state candidly both sides of the question, and then, not having made light of the doubtfulness which must be present in many of these cases, leave the decision in other hands, taking care to secure that the friends of the other party to the contract have the matter also put before them. In other and different cases, where the external signs of effeminacy are well marked—viz., the puerile or falsetto voice, the small penis, the abundant fat, the hair absent on the face and scanty on the pubes, or where the patient is over thirty, or much younger, but with a history of severe and repeated inflammation of the testicles (as in the case I have given at p. 53), the medical man will be justified in saying that a very strong suspicion exists that such patients are incapable of impregnating the female.

It is possible that the position of the testes in the abdomen will be more favourable to the fertility of their secretion than their arrest lower down in the inguinal canal, owing to their greater liability, when in the latter position, to waste, from their exposure here to injury and the constant pressure of surrounding parts.

Complications of Misplaced (Retained or Ectopic) Testis :—

A. **Inflammatory.**—(i) **Recurrent Inflammation.** (ii) **Gangrene.** (iii) **Simulation of Strangulated Hernia.** (iv) **Epididymo-orchitis** (*α*) **from Gonorrhœa,** (*β*) **from passage of a Catheter.** (v) **Peritonitis.** (vi) **Atrophy.** (vii) **Hydrocele, acute or chronic.** (viii) **Hæmatocele.**

B. **New Growths.**—(i) **Malignant.** (ii) **Tubercular Degeneration.**

C. **Complication with Hernia.**

A. **Inflammatory Complications.**—A misplaced testicle readily lends itself to these, partly because it is usually more exposed to repeated irritation and injury than if safely lodged and mobile in the scrotum, and partly because, fixed amidst very straitened surroundings, its nutrition suffers.

(i) **Recurrent Attacks of Inflammation.**—These are very common with retained testicle. In the inguinal variety they form the rule. This is especially the case when a testicle, previously mobile, becomes suddenly fixed in a new and narrower situation. The attacks may be acute or chronic. The causes* are mostly traumatic—*e.g.*, strains, blows, twists, sudden efforts, as in stooping to draw on a boot, violent contraction of the abdominal muscles. In children, a fall, as over a fender, or a blow from the elbow of a companion in wrestling. Amongst the non-traumatic, gonorrhœa, and the passage of a catheter, &c., have been noted.† These are alluded to, separately, later. By far the most frequent in inguinal retention, the attacks are uncommon in the iliac variety owing to the more protected position of the testicle; and

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* Many of these are given in the cases recorded later. The lifelike account given by one of my patients of his case, at p. 53, is especially noteworthy.

† One case is recorded in which a retained testicle became the seat of inflammation due to an attack of mumps.

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their onset is longer deferred in the cruro-scrotal and the perinæal varieties, owing to the usually greater mobility of the organ here. The following is the kind of history that may be expected in the case of inguinal retention, the commonest variety. A swelling, with its long axis in the direction of the canal, has usually been noticed from birth in the region of the groin; this, owing to non-examination of the scrotum, is too often taken for a hernia, especially when in young children, owing to the mobility of the testis, this disappears in part or altogether when the child lies down, and a truss is worn, but irregularly, owing to the pain. On some occasion of a strain, blow, &c., the swelling is noticed to become larger,* harder, and intensely painful, the onset of these symptoms being perhaps attended by the sensation of something giving way. In a child, the history perhaps is that it has come in crying from playing, with "the lump" painful and increased in size. Colicky pains in the abdomen, constipation, furred tongue, and nausea are not uncommon. The swelling is usually about the size of a bantam's egg, for the most part solid, but in part, when of long duration, often elastic or fluctuating, this latter corresponding to effusion into the tunica vaginalis, as in the case related at p. 42. The swelling shows little if any impulse when the patient coughs. The integuments over it are usually natural, but exquisitely tender, the pain shooting up along the course of the ilio-inguinal nerve to the lower part of the back, and also downwards over the hip. These attacks occur frequently, and though at first they yield to treatment, the parts feel sore and bruised for some days afterwards, and the patient may go about with the body bent forwards, and with cautious gait. The date at which these attacks begin to occur varies with the activity of the life of the patient, and the mobility of the testicle. They are rarely deferred after the age of eighteen, and having once set in they are liable to be brought about by such simple movements as the stooping to draw on a boot, getting into a cab, starting to run, thus crippling and marring the patient's life utterly. Sometimes the first attack is sufficiently severe to call for active treatment. Their unexpected suddenness and liability to occur at times and in places which render the patient helpless, as in the case at p. 53, are amongst their most serious features.

The chief points in the diagnosis are the empty half of the scrotum, the shape, well-defined outline, and the position of the swelling, the testicular sensation on pressure when the swelling is quiescent, the character of the pain, especially its onset, and the repetition of the attacks. The incompleteness of the apparent reducibility, the absence of any gurgling, or the feel of omentum on handling the swelling, are also noteworthy.

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* When in the case of a retained testicle sudden increase in size has taken place, this may be due to acute orchitis, or hydrocele, to the swelling of inflamed adhesions, or to a hernia.

Treatment of Misplaced and Inflamed Testis.[*]—This will be usually palliative at first, for neither the parents of a child who is the subject of this affection, nor, later on, the patient himself, will be willing to consent to an operation which may involve the loss of a testicle, until they have had proof of how annoying is the often recurrent crippling of this affection, and how much it interferes with an useful and active life.

In the case of a child, poppy-head or hot boracic fomentations, warm baths, a few grains of hyd. c. cret. and pulv. Dover, every four or six hours, and a little castor oil if necessary, will be all that is required. In that of an adult, the above fomentations or an ice-bag, the application of six or twelve leeches in a vigorous adult, followed by warmth, one or two doses of pil. hydrarg., followed by a saline antimonial draught, or the above given powder in large doses—these, with absolute rest, will quickly relieve the pain. A little later, flying blisters, if the patient will put up with the temporary discomfort, are often most efficacious.

Where it is plain to all that more must be done, the choice of operations will lie between transplanting the testicle and castration. In a few cases, where the patient is still young, and the testicle, having been but little irritated and inflamed, is still healthy, where the testicle is still mobile, and in cases where the scrotum is sufficiently developed, an attempt to transplant the testicle should certainly be made, according to the steps given at p. 85. But where the patient has passed adolescence, where the attacks have been numerous, and the testicle is fixed and its structure impaired, where the scrotum is undeveloped or atrophied, in cases where a hernia is present, and a radical cure is desired, castration should be preferred, as in the two next cases, and in those given later at pp. 76, 82. The following case is of interest, being one of iliac retention. My reasons for preferring castration to any attempt to bring down the testis into the scrotum are given below. It will be seen that they were justified by the condition of the testicle.

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[*] The treatment of retained testis by transplantation into the scrotum will be given separately, p. 85.

A case of transplantation of a testicle the subject of iliac retention into the scrotum, will be found at p. 79.

Left Iliac Retention; Exploration; Removal of Testis and Funiculo-vaginal Process; Suture of External Abdominal Ring; Recovery.

W. L., aged seventeen, a grocer's assistant, was sent to me at Guy's Hospital, by Dr. Carroll, of East Dulwich, May 30, 1891. The left testicle has never been in the scrotum, and the corresponding half of the scrotum is absolutely undeveloped. Has not been aware of any swelling in the groin until ten days ago, when, after lifting a heavy weight, he was seized with a severe catching pain in the left groin, and found a swelling there. Both the pain and swelling disappeared during the night, but similar seizures have recurred twice since. On admission, on feeling for the absent testicle, it is not to be felt in the canal, but by dipping deeply in the iliac fossa an oval mass can be felt which apparently represents the testicle. The external ring readily admits the finger, and the canal is dilated. Very high up, the point of the finger impinges on a body which the patient states is the testicle. I advised exploration and removal of the testis because (1) the left half of the scrotum was so absolutely undeveloped; (2) the testicle was so high up (an iliac retention) that it was very doubtful if it could be brought down; (3) the condition of the canal and external ring called for firm closure, a step which would be much facilitated by castration. I may add that there was very distinct impulse on the right side at the internal ring. The patient was otherwise well developed in every respect. June 5th, operation. The same precautions and preliminary steps as in the case at p. 85. On slitting up the external ring and lower part of the canal, a tubular body rich in veins, and taken at first for the cord and upper part of the pampiniform plexus, came into view. On being further examined and opened, it proved to be only the funicular process of peritonæum unobliterated. The testicle could just be felt by the finger passed along the canal, lying within the internal ring, and was hooked down with some difficulty. The cord being transfixed with stout chromic gut, the testicle* was cut away; the funicular process, which reached to a little beyond the external ring, was then freed from the adjacent parts, twisted up to the internal ring, transfixed and tied here with carbolized silk, and cut away just below this spot. The external ring and the part of the canal that had been slit up were then sutured with buried chromic gut sutures. Drainage was provided in this case with horsehair drain and drainage-tube, just as in the case at p. 77. Here, however, it proved insufficient. A week after the operation, at the second dressing, the wound was found to be suppurating, and a further counter-opening was required in the scrotum. After this, the wound healed quickly and was all closed by July 6. On July 15 the patient went out, wearing a truss of light pressure. He was seen at the end of August, with a firm deep cicatrix entirely devoid of bulging or impulse.

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* This was small and badly developed. Mr. Parkin, at that time Surgical Registrar, reported that on microscopic examination no spermatozoa could be found.

The chief interest of the following case lies in its having been reported by the patient himself.

Inguinal Retention in an adult aged twenty-two; Frequent Recurrent Attacks of Crippling Inflammation; Removal of a Functionless Testicle; Recovery.

H. E. L., aged twenty-two and a half, was sent to me by Dr. Randall, of Beckenham, Jan. 1891. The following account of the case was written out by the patient himself:—"I first noticed these attacks about six years ago, my age being then about sixteen. At that time they were generally caused by my wearing a belt or sash round my waist. The first occasion on which I took serious notice of it was, on returning from a long ride, when I fell from my horse senseless from the pain, and was unconscious for some time. That was in Sept. 1888, and since then I have not mounted a horse. On another occasion it was brought on by lunging when fencing, and I have strained it at gymnastics, tennis and boxing. The last occasion I felt it while walking near Victoria Station. I immediately hailed a cab, and drove to Charing Cross to go home. At Charing Cross I became so bad that I had to lie on my back on a seat on the platform. On arriving at my destination I drove at once to see Dr. Randall; he advised the operation. The pain was like that resulting from a blow on the testicles, but duller. The effect was to double me up, so that I could not stand upright; it made me feel sick and faint."

At the operation, the testicle was found in the lower third of the inguinal canal; it was markedly ill developed, with thickening of the tunica albuginea, the corpus Highmorianum, and the interglandular supporting connective tissue. A search for spermatozoa proved fruitless. The patient made a good recovery. In

July 1892 I heard from Dr. Randall that the patient remained well in every way.

(ii) **Simulation of Strangulated Hernia.**—(iii) **Gangrene.**—I propose to consider these together, as the symptoms and importance of early treatment are very similar in each. In some cases the inflammation is more extreme than that already described.

It is possible that the following case was one of acute inflammation due to torsion, but I do not think so, as there is a history of distinct injury, and of repeated attacks of inflammation from a very early period of life; moreover, the case ended in recovery, instead of in gangrene or atrophy, as in the cases of torsion given below. The effusion of blood and serum into the scrotum concealing the absence of the testicle, the incorrect history given by the patient, the closeness with which the symptoms of strangulation were simulated, all rendered the diagnosis difficult. Pott was sent for in a great hurry, to operate for hernia in a young man who was suffering most acute pain in the groin and back. The day before, he struck his groin against some timber, which caused such exquisite pain that he fainted, the groin becoming immediately much swollen. The patient stated that he had long had a rupture on that side, which had never entirely returned. The patient was bled twice, and the swelling poulticed, attempts being then made to reduce it. Two enemata and a purge were given, but without effect. The pain was exquisite, the patient very sick, and the groin and scrotum much swollen and very hard. Though the scrotum was full and large, it was much harder than Pott had ever found a piece of intestine to be. The discoloration was not at all like the effect of mortification, but had all the appearance of ecchymosis. The man had not had a fair stool for three days; he had been very sick; his belly was tight, hard and painful. The tumour was so exquisitely painful that he could not bear the slightest touch. On inquiring further concerning the rupture, it was ascertained that he had worn a truss for the first four years of his life, but that the rupture was never kept up perfectly, and that as he ran about he was obliged to leave off on account of the pain it caused; that since then little alteration had been observed in the tumour, which never gave any uneasiness as long as he did not handle it or allow his waist-band or watch to press on it. Before deciding to operate with this unsatisfactory history, Pott ordered a smart purge, which produced an abundant result. By means of fomentations, &c.,

the swelling subsided, and in about a week the scrotum could be examined sufficiently accurately to determine that it contained no testicle. The patient now allowed that he had never had one on that side. A little later there could be made out in the groin a retained testicle, which, having been much bruised, had caused all the mischief.

(iii) **Gangrene.**—In the following cases, the inflammation of a retained or misplaced testicle running very high passed on into gangrene. I may say at once that this takes place under two conditions. (*a*) Where there is no torsion of the cord, but the gangrene follows repeated attacks of inflammation set up in a retained testicle, usually in the groin, gradually becoming more and more fixed, increased in bulk from presence of inflammatory effusion, and perhaps a hydrocele, and with its vitality more and more impaired. (*β*) Where torsion of the cord has occurred.

The following is a good instance of gangrene of a retained testis following recurrent attacks of inflammation.*

A lad, aged nineteen, came to my out-patients at Guy's Hospital November 1879 with the following history. The left testis had never descended into the scrotum. When the patient was fifteen months old, a tumour appeared for the first time in the groin with sickness and syncope. This attack passed off; no truss was applied, and no further trouble was experienced till the age of eleven, when the swelling again appeared. The patient began to wear a truss when about fourteen, but finding it very inconvenient, and no swelling having appeared for some years, he obtained permission from a medical man to leave off the truss. Two days after doing so, pain returned in the groin. When I saw him the pain was intense; a hard, defined swelling existed in the left groin, without impulse when the patient coughed. The abdomen was tense and full, and coils of distended intestine could be seen through the parietes. Constipation had existed for twenty-four hours, but there was no vomiting. Believing that a piece of intestine adherent to the testicle had been drawn down by it, and had become partially strangulated, I admitted the patient with a view to exploration. Mr. Howse, as surgeon for the week, shortly after operated. When the coverings of the canal had been divided on a director, a bluish encysted swelling was found, with very vascular walls. This, when punctured, was found to contain the testicle in a state of gangrene. On section, it presented much the appearance of black currant jelly, traversed here and there by a few unaltered septa and tubules. Another black cyst-like swelling was found to be the epididymis, and above this the reddish, pulpy, œdematous cord. The patient made an excellent recovery after the removal of the testicle, and went out about a month later wearing a truss of low pressure, and walking well.

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* Mr. Bryant in his paper (*vide infra*) suggested that this was a case of torsion of the cord, but this condition was not present at the operation, and there was a history of recurrent attacks.

It seems to me very probable that in this case the testicle, still mobile, was kept up by the truss. During this time the canal, being ill-developed, was small and tight. Very soon after the truss was left off, the testicle, by some exertion, was driven down into the canal. Under these conditions acute inflammation rapidly followed, and ran high.

(β) The following cases belong to the second division given above, as here gangrene followed on torsion of the spermatic cord. Nicoladoni (*Arch. f. Klin. Chir.*, 1884, Bd. xxxi. Hft. 1) drew attention to this complication of retained testis. In a young man with inguinal retention of his testicle, acute periorchitis had been diagnosed. An exploratory incision showed that the testicle was tense and bluish-black; two cords were present, and both twisted. One of these consisted of the nerves and vessels, the other of the vas deferens. A second case was very similar, but here the testicle was in the scrotum. Nicoladoni concludes that any testicles which have made a delayed descent, but particularly those the seat of inguinal retention, are liable to torsion of their cords. This, he believes, may correct itself, or simulate strangulated hernia, by appearing as periorchitis, or cause gangrene. He seems to consider absence of a mesorchium as an important feature,* as this allows the testicle to be free and loose. He gives a case where the operation of placing the testicle in the scrotum was much facilitated, the cord being quite free even after the testicle was drawn down. Such freedom would allow the testicle to rotate on its suspending axis, and thus its nutrition would suffer.

The following interesting cases of this condition—strangulation of an undescended testicle from twisting of the spermatic cord, producing symptoms which resemble more or less closely those of strangulated hernia—have been recorded recently by English surgeons.

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* In Gervais's case (*Med. Press and Circ.*, May 14, 1892), reported from Mickulitz's clinic, a too long mesorchium is said to have been the cause of the gangrene. A boy, aged four, fell and hurt his scrotum. Two days later great pain and redness followed, with vomiting and difficulty in micturition, none in defæcation. Bluish-black colour of the scrotum in a young subject is given as a symptom of importance. No information is afforded as to retention or late descent.

Mr. Nash, house surgeon to the Plymouth Hospital, reports the following case, which was under the care of Mr. Whipple (*Brit. Med. Journ.*, June 6, 1891). A lad aged sixteen, admitted Jan. 21, 1891, stated that for seven or eight years he had noticed a lump in his left groin which occasionally disappeared into the abdomen. The day before, at four P.M., he strained himself, and felt something give way in the left groin. At two A.M., on the 21st, he noticed a lump in the groin, and at eight A.M. began to vomit. He consulted a medical man, who diagnosed a strangulated hernia and sent him to the hospital with a note to say that he had had stercoraceous vomiting. Bowels acted slightly at two P.M. that day; before that, ten days ago. In the left groin is an hour-glass shaped swelling. The lower half of this is the left testicle lying in the upper half of the scrotum. The upper, lying over the external abdominal ring, about the size of a hen's egg, is very tense, quite dull on percussion, and gives no impulse on coughing. The parts being shaved and cleansed, Mr. Whipple, on exploring the swelling, exposed in its upper part a dark-coloured tense sac. When this was opened, blood-stained fluid gushed out. A claret-coloured coiled mass presenting itself was made out to be a much enlarged, strangulated epididymis. In the lower half of the sac was the testicle, about normal size, and attached to it was a band of omentum. This tag was torn through, and the proximal part of the omentum, being unaltered in appearance, was returned within the abdomen through a large inguinal canal. The epididymis, which appeared to be twisted twice on its own axis, was pulled down and untwisted. It was then ligatured as high as possible and removed with the testicle, the pedicle being dropped back into the abdomen. The sac was ligatured and cut away, and the pillars of the external ring sutured. The patient got up on Feb. 2, and was discharged Feb. 7.

Mr. Bryant brought a similar case before the Medico-Chirurgical Society (*Brit. Med. Journ.*, Feb. 27, 1892). This also occurred in a boy aged fifteen, the subject of undescended testicle, also on the left side, and just showing through the external abdominal ring. In many points the case simulated strangulated hernia, and in an exploratory operation an imperfectly descended testicle, black from venous congestion brought about by complete torsion of the cord, was exposed. Three half-twists, made inwards, completely untwisted the cord; and an attempt was made to save the testicle, as it was quite warm. A good recovery followed, but the testicle wasted. Mr. Bryant thought that many cases described under inflammation of an ectopic testicle were of this nature, and also that many cases of atrophy of the testicle which had taken place after a supposed inflammation, without any clear cause, were in reality due to strangulation of the cord, which in these last cases was less severe. Mr. Davies-Colley (*Brit. Med. Journ.*, April 16, 1892) published a similar case, but occurring on the right side. A lad, aged fourteen, was admitted with a painful swelling in the right groin caused by the right testicle, which had never descended. The left testicle was of normal size, and lay in the perinæum; it had never given him any inconvenience. The day before admission the patient had had pain in the right groin, and noticed that the swelling there had increased. He also had an attack of vomiting. In the right inguinal canal was a very tender swelling the size of a small hen's egg, without impulse when the patient coughed. The bowels had acted on the evening of the previous day. An exploratory incision opened a sac-like cavity and gave vent to a little bloody serum. In this cavity were packed together three tense, black, shining, but soft ovoid bodies, rather like small leeches, connected together by rather tight constrictions and extending up to the internal abdominal ring. The swellings represented the epididymis, and the constrictions were found to be due to a twisting of the cord. The testicle was found below and behind the epididymis. The vas deferens could be felt close to the internal ring. The incision being carried to the bottom of the scrotum exposed a continuation of the processus vaginalis, which was slit up. Mr. Davies-Colley sewed the testicle by two catgut stitches, and also the lower part of the black mass representing the epididymis, to the scrotum. No hernia was present, and no communication with the peritonæal cavity was made out. The patient made a good recovery, but the greater part of the testicle sloughed away. In this case there appeared to be a mesorchium, and the torsion of the cord was in an inward direction. As there was no history of recent exertion or strain, Mr. Davies-Colley was disposed to attribute the twisting to some slow change produced by the downward pull of a persistent gubernaculum below, modified by the resistance of some intra-abdominal adhesions which had originally brought about the retention. Some recent changes in the size and vascular supply of the testicle, on account of the approach of puberty, had probably, either alone or with the aid of some movement, increased the already existing torsion, and so caused the acute symptoms.

Mr. Page has recorded (*Lancet*, July 30, 1892) the following case, in which the discoloration and œdema of the scrotum was present, a symptom already pointed out by Gervais as an important one in the diagnosis of this condition when occurring in a young subject.

A lad, aged seventeen, was admitted into St. Mary's Hospital, June 4, 1892, with the following history:—On the night of June 1 he had been awakened by severe scrotal pain, the part being found to be swollen and tender. In spite of rest in bed and of fomentations, both the swelling and tenderness increased, and the scrotum itself became red and œdematous. As the lad had been sick once, and as constipation existed, a suspicion of strangulated hernia arose. On admission, the swelling and tenderness of the scrotum and cord, right up to the inguinal canal, and the redness and œdema of the scrotum, had very much increased, but it was impossible to say what was the cause of so much inflammation. The patient's temperature was normal. He did not look ill, local trouble and pain were alone manifest. On exploration of the swelling the condition of parts was that of the congenital variety of hernia, with the testicle black and distinctly gangrenous, and the epididymis greatly swollen and of a deep chocolate colour. This had been produced by torsion of the cord, which was easily untwisted by two turns to the left. The site of the twist was at the external ring, and there was no apparent cause for it. All the dead tissues were removed, and the open funicular process of the peritonæum was closed by ligature. The wound healed without rise of temperature, and the lad left the hospital June 24.

Mr. Page pointed out that under subcutaneous and presumably aseptic conditions the gangrenous structure might presently have atrophied, as pointed out by Mr. Bryant, and the conclusion in the future would probably have been that in consequence of acute orchitis, due to gonorrhœa, the testis had atrophied and disappeared. The cause of the twist is difficult of explanation; perhaps some malposition of the testis, either congenital or induced by a truss (which the patient had worn for a considerable time), was an essential predisposing cause. Mr. Page also referred to another point of much interest. In this case was a gangrenous testis and epididymis, with all the signs of acute inflammation, and yet, from first to last, there was not a drop of pus in connection with the gangrenous tissues or with the operation wound.

The following case recorded by Mr. Langton (*St. Barth. Hosp. Reports*, vol. xvii. p. 188) was diagnosed by him as a hæmatocele, owing to the suddenness of the enlargement, and the fact that the fluid which was evidently present was not translucent. The account of the case is headed "Hæmatoma of the Epididymis." I would suggest that the case would be more correctly placed under the heading of "Torsion of the Cord," on account of the sudden onset, without injury, the œdema of the scrotum, the dark blue colour of the testicle, almost black in the case of the epididymis, the twist, apparently at the junction of the epididymis and cord, and especially the very free mobility of the testicle.

If I am correct in the above opinion, the case is most interesting, owing to the age of the patient and the fact that the testicle was *in situ*, two points in which the case differs markedly from those already given.

H. B., aged thirty-three, was admitted April 19, 1881, with the history that he was perfectly well till three weeks ago. He then caught cold, and this was followed in a few days by swelling of the left testicle. This attained its present size in the course of a few days, and without much pain. He is very positive that there has been no injury. A tumour, the size of a large orange, occupies the left half of the scrotum, which itself is neither red nor discoloured but only slightly œdematous. The tumour is not translucent, though it evidently contains fluid. The cord is free and normal. The suddenness of the enlargement, as well as the examination, pointed to the case as being one of hæmatocele, but there appeared as well to be some enlargement of the testis. An ounce of blood-stained serum was evacuated on tapping the tumour. After this, there still remained what appeared to be a large testis with a greatly enlarged epididymis. The testis was smooth and painless, the epididymis irregular and hard. April 23, the fluid having re-collected, an incision, 3 inches long, was made into the tunica vaginalis, when a considerable amount of blood, partly fluid, partly coagulated, escaped. The testis was, by the force of the escaping fluid, almost ejected through the wound, so that the tunica albuginea was unavoidably slightly incised. The testis was so mobile, owing to an unusually extensive reflection of the visceral layer of the serous covering that it could be entirely lifted out of its sac, being simply suspended in it by the cord. The epididymis was much enlarged, irregular, tense, and of a deep blue, almost black, colour. Its upper part presented a deep constriction, as if twisted upon itself; above this point the cord was natural. An attempt was made to untwist it, but without success; for the appearance was as if the entire viscus had been twisted upon its own axis, and that blood had been rapidly effused into the epididymis, constituting, in fact, an apoplexy of this body. Free suppuration followed, with no attempt of union of the wound, and by May 20, the testis and epididymis had sloughed out. The patient was discharged, May 23, with the wound all but healed.

(iv) **Epididymitis** and **Orchitis from** (*α*) **Gonorrhœa,** or (*β*) **Passage of a Catheter.**—Hitherto we have spoken of inflammations to which a retained testis is liable from injuries or torsion of the cord. MM. Monod and Terrillon consider **gonorrhœa** as a more frequent cause of inflammation of such a testicle than injuries. Thus, at p. 64 of their work, they put it first amongst the causes of inflammation of the gland; a little later this statement occurs: "Après la blenorrhagie, la traumatique est la cause la plus fréquente de l'inflammation du testicale ectopié." This is certainly not the experience of English surgeons. In this country injury is by far the most frequent cause, and gonorrhœa almost unknown. This complication may be met with in any variety of misplacement of the testis, but owing to the greater frequency of inguinal retention, it is in this variety that most cases have been met with. The shape of the swelling is, of course, not so characteristic as in those cases where the testicle is in the scrotum; in those cases where the testis is retained in the groin, but the epididymis and vas deferens loop down in front of it into the scrotum, great pain and tenderness will be complained of here, though the testis itself is absent. The importance of remembering that a testis misplaced into the perinæum may be the seat of gonorrhœal epididymitis is shown by the fact that Ricord met with two such cases, one of which he was about to open as a perinæal abscess. MM. Monod and Terrillon quote two cases in which a testicle the subject of iliac retention was the seat of this complication. Peritonitis is here, as in the case given at p. 62, a terrible risk. In all these cases, where the diagnosis is difficult, a careful examination of the scrotum is needed.

Epididymitis due to use of the Catheter, &c.—I am not aware of any English case of this kind. The above French authorities quote one case in the practice of Boyer, and also a rare but interesting one, in which inflammation of a retained testicle occurred in the course of an attack of **mumps.**[*]

(v) **Peritonitis.**—This grave complication has been noticed in a few cases of retained testicle, in which inflammation has followed epididymo-orchitis; strenuous attempts at taxis, where a painful retained testis has been mistaken for a hernia; and, as in the case below, after an injury. While this complication will be more dangerous when starting in a testicle, the site of iliac retention, it can readily follow on cases of inguinal retention, where the funiculo-vaginal process is continuous with the peritonæum. Mr. Curling (*loc. supra cit.*, p. 39) gives the following noteworthy instance. A boy, aged ten, was brought to the London Hospital dangerously ill with acute peritonitis. His mother stated that the day before he was kicked in the groin by one of his school-fellows. He suffered great pain at the time, and the next day became very ill. When admitted, the child was almost in a state of collapse, his abdomen hot, bruised, and extremely tender. There was a diffuse swelling in the right groin, and the right half of the scrotum was empty. Death took place twelve hours later. At the examination of the body, there was general peritonitis with effusion. In the right iliac fossa were two small recent abscesses beneath the peritonæum. An atrophied testicle was discovered close to the external ring, amongst a mass of connective tissue infiltrated with pus and lymph. There were indistinct traces of a tunica vaginalis continuous with the peritonæum.

(vi) **Atrophy.**—If a retained testicle were the subject of retention only—*i.e.*, not subjected to irritation and its results—deficiency in size would no doubt be found to be the rule. As it is, a retained testis often remains smaller than its fellow for some years, unless transplanted into the scrotum. But as life goes on recurrent inflammatory attacks lead to increase in size, which may be exaggerated by the presence of a hydrocele, and, unless the faulty organ is removed, steady increase due to degeneration of a malignant kind may ultimately supervene. The functional condition of a retained testicle is fully considered at p. 45.

(vii) **Hydrocele.**—This has occasionally been met with in the variety of iliac retention, more frequently in the inguinal. An important distinction must be made between the **two chief varieties** in which the collection of fluid presents itself. (A) The hydrocele is in communication with the peritonæal cavity by means of a more or less patent processus funicularis, being thus analogous to a scrotal congenital hydrocele. In each, the chief clinical characteristic is the reducibility of the fluid. The readiness with which this takes place varies, sometimes being marked, with the slightest pressure, or when the patient lies down. In other cases the fluid is returned with difficulty or imperfectly, owing to the narrowness of the communication. In some cases the testicle plugs the canal* and prevents any descent of the fluid; in others the fluid descends below the testicle, and may come down into the scrotum and its presence be detected by translucency. (B) In the second variety, the tunica vaginalis is shut off from the peritonæal cavity, and the fluid therefore entirely irreducible. In some of these cases also the fluid may descend below the testicle into the scrotum, and having distended the parts around mount upwards and outwards beneath the integuments of the groin.

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[*] A case of M. Catelan's, quoted by M. Alliez, *De l'Orchite inguinale. Thèse de Paris*, 1876.

Other forms under which a hydrocele may present itself with a misplaced testicle are those where the fluid is encysted in the inguinal canal, shut off by adhesions above and below, some of these adhesions being between the funiculo-vaginal process and the testis itself. Secondary pouches are sometimes found, leading out of the main one. In another variety the fluid occupies the canal and the scrotum, as in the first two above quoted, but its shape is markedly that of the hydrocele "en bissac" (p. 171); and the constriction being at the external abdominal ring, in some of these the fluid instead of, or as well as, distending the scrotum, may mount upwards beneath the integuments of the abdominal wall.

Another classification of the hydroceles which may occur with retained testicle, and I refer now to the inguinal variety, is *acute* and *chronic*. The former occur after an injury, and the testicle being usually affected as well, constitute an instance of the condition formerly known as hydro-sarcocele. The following instance of inguinal hydrocele (Holthouse, *Clin. Soc.*, vol. iii. p. 109), on account of its being accompanied by symptoms suggesting strangulated hernia, and the position of the fluid between the skin and external oblique is noteworthy. The patient, aged forty-eight, was admitted into the Westminster Hospital with a painful tumour in the right groin—for which he was wearing a truss—and great tenderness and distension of the abdomen. The swelling had existed twenty-five years, and had been occasionally painful. It was said to have much increased in the three days previous to admission, and the day before he had vomiting. A warm bath and the taxis had been tried. Further examination led to the diagnosis of an inguinal hydrocele, with the following characters. It was situated between the skin and the right external oblique, extending into the inguinal canal and the upper part of the scrotum. It was soft and fluctuating, dull on percussion, and with no impulse when the patient coughed. The scrotum was ill-developed and contained no testicle, but a small hard body could be felt in the inguinal canal. The patient was quickly relieved by palliative treatment, his tympanitis and abdominal pain, which had been mistaken for peritonitis, being due to diarrhœa and miserable living. In another case, in a patient aged sixty (Curling, *Path. Soc.*, vol. ix. p. 316), in which the hydrocele also mounted up upon the external oblique (it is not stated whether the scrotum was undeveloped on that side), the cyst contained about 6 ozs. of serous fluid. The vas deferens coursed over the wall of the cyst in its way to the epididymis.

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* In some of these cases the plugging of the canal by the testicle may be so close that not the slightest impulse can be detected when the patient coughs, and yet on removal of the testicle the communication with the peritonæal cavity is found to be a very free one, and to lead, unless antiseptic precautions are taken, to dangerous, or even fatal, peritonitis, as in a case of Gherini's (*Ann. Univ. di Med.*, 1858).

The **diagnosis** is mainly of importance in those cases where the fluid is clearly reducible. But these will be distinguished from hernia if attention is paid to the absence of gurgling, or any sudden slipping away from the fingers of the contents of the swelling, which go up more slowly and with greater difficulty than is the case with a hernia.

(viii) **Hæmatocele.**—I am not aware of any recorded case of this complication of a misplaced testicle.* This is explained by the fact that these testicles are not exposed to the two usual exciting causes of hæmatocele. Thus, any hydrocele present is not treated by frequent tapping, while the injuries to which they are liable, while sufficient to cause sickening pain and to cripple the patient, are not severe enough to cause a traumatic hæmatocele.

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* Sir W. Fergusson (*Med. Times and Gaz.*, 1865) published a case of a large blood cyst developed in connection with a testicle the subject of inguinal retention. The swelling occupied all the left inguinal region, and reached upwards almost to the umbilicus. Its nature remains obscure, but it is noteworthy that while three previous punctures had only withdrawn serum, a fourth gave vent to bloody fluid. After a free incision, three pints of serum and blood clot were turned out. The patient recovered. M. Lionville (Le Dentu, *Des Anomalies du Testicule*, p. 152) seems to have met with a hæmatocele—*i.e.*, a mass of coagulum, apparently in the cavity of the tunica vaginalis—in connection with a testis retained in the belly of a dog.

(ix) **Tubercular Degeneration.**—This is a very rare complication of misplaced testicle, the explanation perhaps being that, owing to its altered structure, the testicle does not readily lend itself to the changes which are summed up in the term "tubercular testis."

Such a case is given by G. Fischer (Hanover, *Zeitschr. f. prakt. Heilkunde*, 1, 1864). Another case, quoted by Godard, is considered unconvincing by MM. Monod and Terrillon owing to its briefness and absence of details. It is the one recorded by F. Robert, which he met with *post mortem*, where the testicle, which had never projected into the groin, the kidney and the psoas muscle, in part, were softened and converted into a substance "truly tubercular."

At present no instance of tubercular disease attacking a retained testis can be said to have been verified. And the same may be said of syphilis.

B. **Complication with Malignant Disease** (Fig. 10).—This terrible complication is far from infrequent, considering how comparatively uncommon are displaced testicles. It is especially when retained in the inguinal canal that the testicle is attacked with malignant disease. Prof. Virchow, when discussing the origin of malignant growths in lesions resulting from injuries, explains this frequency on the following grounds:—Testicles retained in the inguinal canal are especially liable to injuries; they are also exposed to muscular constriction and friction from the bands between which they lie. Furthermore, from their low degree of development, they are prone to take on degenerative changes.

The variety of the growth has not been exactly determined, owing to a sufficient number of cases not having been examined according to the requirements of modern histology. It is, however, always malignant, and rapidly so, most often as a soft sarcoma, more rarely as encephaloid carcinoma.*

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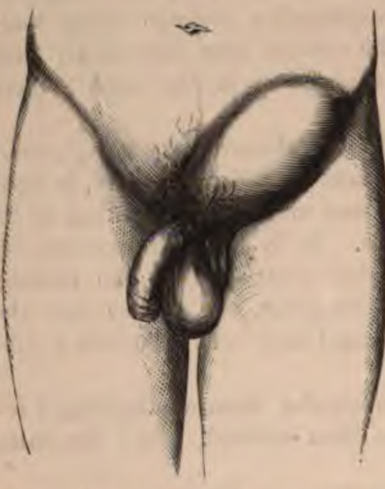
* Kocher figures (Fig. 70) a specimen of colloid carcinoma (*Gallertcarcinom*) taken from a specimen of retained testicle in the Museum at Freiburg. The patient died of extension of the same disease to the peritonæum.

A very much smaller group exists in which new growths of a less malignant kind attacked misplaced testicles. An instance of these is the following case of cystic disease mingled with cartilage, and probably an early stage of sarcoma. It was under the care of M. Jarjavay, and was brought before the Anatomical Society of Paris in 1868, by M. Hénocque. A man, aged twenty-eight, whose left testicle had been arrested in the fold of the groin, presented in this region a tumour the size of a fist, with its long axis along Poupart's ligament, mobile, and without adhesion to the skin. Nothing could be felt in the left side of the scrotum save a small knotty cord, apparently a plexus of veins. The swelling seemed to be divided into two lobes, the lower of which was thought to correspond to the epididymis, and the upper to the testicle. Pressure was painful and likened by the patient to that upon the right testicle. For two months the swelling had been painful, and in this time its increase had been rapid, The swelling was irreducible, without fluctuation or translucency, but presenting a fleshy feel. The tumour on removal showed in its centre a number of cysts of varying size; at the two extremities there were fewer of these, and the appearance was here encephaloid. The testicle was found at the periphery, flattened out. Microscopically the cysts were lined with cylindrical epithelium. In the part which, to the unaided eye, looked encephaloid, similar cysts were found. The connective tissue between the cysts showed abundant cell-proliferation, and at a few places small masses of cartilage in process of formation.*

FIG. 10.



Malignant disease of testicle retained in left groin. (Osborn.)

To return to the really malignant cases, the great majority appeared in patients between the ages* of twenty-five and forty-five, and in strong healthy subjects.

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* Prof. Kocher (*loc. supra cit.*, p. 423) says that three cases of cystic disease and one of enchondroma have been recorded. No further details are, however, given.

The following are the chief points in the clinical history of these cases :—A patient, the subject of a retained testis, which has been more than once the seat of injury and inflammation, notices that after one of these attacks the swelling does not subside. The testis, previously perhaps the size of a walnut, forms, in spite of treatment, a rapidly growing tumour situated parallel to the fold of the groin and soon reaching the size of a fist. It is tense, and now no longer of equal consistency all over, but at one or more spots gives evidence of fluid. The swelling is without impulse on coughing, and testicular sensation is lost. As it increases in size, pain is more and more a marked feature, the skin becomes adherent and dusky, with conspicuously enlarged veins, the lower extremity on the same side becomes œdematous, and death closes the scene usually within two years from the commencement of malignant degeneration.

The above applies to malignant disease of a testicle retained in the inguinal canal. Where the testis so affected is within the abdomen, the case is at first by no means so clear. Obstinate uneasiness, soon amounting to pain, felt deeply in the iliac region, coming on first after some exertion, and liable to occasional and terrible exacerbations, a marked firmness and rigidity of the abdominal muscles, an increasing tendency to sit and stand doubled up; these points, together with the absence of one testicle, will enable the surgeon to form a suspicion of the nature of the case, even while the growth is deep in the iliac fossa.†

The following case‡ of malignant disease of a testicle the subject of abdominal retention I saw during life. The diagnosis was easy, owing to the absence of the testicle from the scrotum. I advised against operative interference, as enlarged iliac glands could be distinctly made out.§ The case is of interest, not only from the rapidity with which it ran its course, but also as it shows that a malignant growth of this kind may remain non-adherent and apparently favourable for removal, and yet secondary growths may be abundantly present.

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* The youngest was a boy of seven (Kocher), the oldest a man of fifty (a case of Mr. Hodgson, of Birmingham, reported by Mr. Arnott, *loc. infra cit.*).

† Sir G. Johnson has recorded (*Med. Chir. Trans.*, vol. xxx. p. 9) an interesting case of "encephaloid cancer" affecting a testicle retained within the cavity of the abdomen.

‡ Dr. Mahomed (*Path. Soc. Trans.*, vol. xxxiv. p. 182).

§ Mr. Howse saw the case afterwards, and also declined to operate.

R. R., aged thirty-four, presented a tumour in the hypogastric region, occupying the position of a distended bladder, semi-elastic to the touch. The tumour rose and fell with distension and evacuation of the bladder. The inguinal and iliac glands were enlarged. Death occurred five and a half months after the swelling was first noticed. The right testis, much enlarged (weight, 36 oz.), was carcinomatous, it lay with its long axis transversely on the upper surface of the psoas and iliacus, and projected into the hypogastric region. The mass was semi-fluctuating, completely non-adherent to the surrounding parts, which were not affected by the disease. It was pedunculated, and could easily have been removed during life. The peduncle was formed by the vas and vessels, apparently unaffected. There were secondary growths in the retro-peritonæal glands, thymus, bronchial glands, &c.

Treatment.—This may be summed up in one word—removal. This step is always to be urged as soon as there is reason to believe that this change has begun, or, if possible, when it is impending. Extension of the disease upwards along the cord to the lumbar glands is quite as common in these cases as in malignant disease of a testis normally placed, and there is additional motive for early operation now on account of the greater difficulty of dividing the cord at a safe distance from the growth.*

The operation for removal will vary somewhat according as the retention is (I.) inguinal, or (II.) iliac or abdominal. I. *Inguinal Cases.*—In the performance of removal here, the steps of a herniotomy and a castration must be combined. The growth must be exposed by a free incision, and here an observation of Szymanowski's is worth remembering—that where the new growth has attained a large size, the abdominal walls will be found much thinned, or even partly perforated, so that the diseased testicle lies almost subcutaneous. Every care should be taken to remove the entire growth, in its capsule, intact. The bulk of this may be diminished, if needful, by tapping any hydrocele present. Irrigation with solution of hyd. perch. (1 in 2000), and the strictest antiseptic precautions should be employed from first to last. If there is any risk of opening the peritonæum, antiseptic sponges should be at hand to pack around and thus shut off this cavity. Where there is reason to suspect that portions of the growth have been left behind, infiltrating the adjacent muscles, the sharp spoon must be used, or a paste of zinc chloride and flour in equal parts should be applied to the suspected parts on strips of sal-alembroth gauze, these being removed in twelve hours. In this case the wound must, of course, be left open. The cord, which is often short in these cases, should be examined and tied as high up as the internal ring.

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* In Mr. Arnott's case (*Med. Chir. Trans.*, vol. xxx. p. 9) a large "medullary sarcoma," originating in a testis retained in the right groin, was removed. On the patient's death, on the fifteenth day from facial erysipelas, a small deposit of encephaloid substance was found on the right spermatic cord, just within the inner ring, and a large mass in the root of the mesentery, this, owing to the patient's being fat, not having been detected during life.

Risks of the Operation.—MM. Monod and Terrillon (*Arch. Gén. de Méd.*, 1880, t. i. pp. 128, 297) discuss the peril of castration here, and show that the risk of peritonitis, opening the peritonæum, finding adhesions of viscera to the testicle, is much exaggerated, judging from results.

Thus, out of fifty cases which they have collected, peritonitis was only observed in three cases, and only proved fatal in one. As a rule there is no communication with the peritonæal cavity, it being distinctly stated in most cases that the vaginal sac was an absolutely closed cavity.*

Unhappily, recurrence is almost certain after a varying interval. In only one of the above cases (Desprès, *Bull. de la Soc. Anatom.*, 1875, p. 171) was there a hope of a permanent cure, the patient being perfectly well at the end of four years. The disease here was sarcoma.†

II. *Abdominal or Iliac Retention.*—In the case of malignant disease of a testicle thus retained, it will be right, after explaining to the patient the risk of such an operation, and the inevitable result if the growth be left, to explore and give him the chance of success. The duration of the case, and the probability of secondary deposits and of adhesions* between the new growth and the abdominal viscera will of course influence the question of operation. Enlargement of the lumbar glands can sometimes be made out by pulsation, while œdema of the lower extremity and evidence that the branches of the lumbar plexus are becoming involved will render this more certain. Emaciation, ascites, and rapid increase of the growth, contra-indicate operative interference.

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* As already stated (p. 42) the vaginal sac may communicate with the peritonæal cavity, and yet any fluid it may contain be irreducible, the testicle plugging the opening. The older the patient is, the less probable is a communication, and, on the other hand, the smaller the interval between the testicle and the internal abdominal ring the more likely is a communication to be present. Occasionally no vaginal process of peritonæum can be made out. This was so in a case of round cell sarcoma of a retained testis removed from a man aged forty, by Mr. Treves (R.C.S. Mus., No. 4239). Enlargement only began four months before removal. There had been no blow, and the patient stated that the organ had never been inflamed. The patient remained well for one year and eight months after the operation, when recurrence took place in the lumbar glands.

† Szysmanowski ("Der Inguinal Testikel," *Prager Vierteljahrsch. f. die prakt. Heilk.*, 1868, Bd. ii. S. 57) collected twenty-two cases of vaginal castration, in not one of which he considered that death could be laid to the door of the operation. This surgeon was unhappily himself the subject of a retained testicle, becoming malignant, and requiring removal. He gives all the details of his case, the difficulty of the diagnosis, the steps of the operation, and the guarded prognosis. He died with recurrence in the scar, a few months after the publication of his paper.

The operation must be conducted on the same lines as an abdominal section. The chief points are—(1) Observance of scrupulous antiseptic precautions throughout, including irrigation with hyd. perch. 1–2000, until the peritonæal cavity is opened, and then taking care that nothing enters this which has not been rendered absolutely aseptic. (2) The incision, whether a median one or one carried vertically upwards from the iliac region, should be sufficiently free to admit of thorough examination of the surroundings of the growth, and also to prevent any risk of bruising the edges of the wound, and so of setting up sloughing or peritonitis by squeezing a large tumour through a narrow outlet. (3) The field of operation should, as far as possible, be rendered extra-peritonæal by packing around aseptic hot sponges so as to shut off the intestines, &c. (4) An attempt may be made to diminish the bulk of the tumour by tapping, great care being taken to prevent any contamination of the peritonæal cavity. (5) The capsule of the growth should be removed if possible. If this is impracticable, the interior should be thoroughly scraped out with sharp spoons, and a paste of zinc chloride and flour (p. 69) applied if needful. If this latter step has been found necessary, the cut edges of the capsule should be sutured to the edges of the abdominal incision, and the wound left open. (6) All oozing must be entirely stopped, and the field of the operation rendered quite dry before the wound is closed. (7) Adequate drainage must be supplied. (8) If there has been any contamination of the peritonæal cavity, this must be washed out with boiled water, or a 2 per cent. solution of boric acid, at a temperature of 100°, and a Keith's tube inserted and sucked out at regular intervals.

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* In Sir G. Johnson's case, which apparently had a duration of ten months, the diseased testis was found, *post mortem*, to weigh about twenty pounds. Adhesions, broken down without much difficulty, existed between the anterior surface of the tumour and the abdominal wall, and also about the right iliac fossa; there were no visceral adhesions.

Very few of these operations have been recorded. Sir S. Wells has operated in one such case, an account of which he kindly forwarded to me. The protection apparently given by the capsule and the absence of any glandular infection are noteworthy.

"The patient was a middle-aged German gentleman. The right testis was cancerous and undescended, and (including two or three pints of fluid in a cyst) weighed nine pounds. The incision was like that for ovariotomy, and 6 inches long. The capsule (tunica vaginalis) was divided, and the tumour shelled out of it; the capsule was otherwise not disturbed. There were no visceral adhesions. The operation was very easy; a few vessels only required to be tied. Death took place on the fourth day from septicæmia. I used a thymol solution (1 in 1000) for spray, sponges, instruments, &c., and I was strongly impressed at the time with the belief that the patient would have recovered if I had used carbolic acid. There was no disease of the lumbar glands."*

In the following case (Dr. Marlier's, *Bull. de la Soc. Anat.* 1880, t. v. p. 460), malignant disease attacked a testicle, the transit of which into the scrotum had been deferred much beyond the proper date. The patient was aged thirty-eight. His right testicle remained at the external ring until he was sixteen, and then passed into the scrotum. It remained, however, much smaller than its fellow. At the age of thirty-six, the testicle began to increase in size and become hard, heavy, and painful. When seen, the testicle was as large as an orange, ovoid, soft in front, hard behind. The cord formed an enormous projection under the skin, and seemed to fluctuate. At the operation this swelling consisted mainly of a hydrocele, the cord itself seemed healthy. The testicle contained yellowish caseating masses of carcinoma.

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* Dr. Czerny has apparently attempted it in another case. A man, whose right testis had never descended, had a small but intensely painful tumour in the abdomen. On abdominal section it was found that a tumour the size of an ostrich's egg, and apparently bounded by a tunica albuginea, lay over the front of the lower part of the spine, firmly bound to this and the aorta by fibrous tissue; the ureter ran over the anterior surface of the swelling. Extirpation was found to be impossible, but the patient made a good recovery from the operation, and is said to have been relieved by it. M. Thiriar (*Ann. des Malad. des Organ. Gén.-Urin.*, 1887, p. 739) reports two cases where the left testicle remaining in the abdomen was attacked by carcinoma. The two tumours, weighing 840 grammes and 1520 grammes, were removed through a free abdominal incision. The first patient died of double pneumonia in a few days. The other recovered.

C. **Complication with Hernia.**—(Fig. 11.) While almost any variety of misplaced or retained testicle may be accompanied by hernia, it is the inguinal variety of retention which is especially liable to this complication. This variety being therefore taken first, it will be found that the hernia and testicle may have the following relations to each other. It will be seen that the hernia always starts as a congenital one.

(1) The funiculo-vaginal process of peritonæum being unobliterated, and the tunica vaginalis thus in communication with the abdominal cavity, the hernia descends along the inguinal canal as far as the retained testis itself, with which it remains in more or less intimate connection, being sometimes connected to it by adhesions. This is the most frequent variety.

(2) The funiculo-vaginal process being in communication with the general peritonæal cavity above, but partially obliterated lower down in the canal, the hernia remains separated from the testicle by a wider or narrower barrier of tissues.

In any case, a hernia accompanying a testis retained in the canal usually remains in the canal also, not passing through the external ring. The position of the testicle, whether the hernia be in contact with it or separated from it above by an interval, is usually, but not invariably, behind the sac.

The following are merely sub-varieties of the above. While a hernia complicating an ectopic testis usually remains in the canal, it may be otherwise.

(3) The hernia insinuates itself gradually, or is suddenly forced beyond the retained testicle, and passes through the external abdominal ring. If the scrotum is developed, the hernia will descend still further, and present itself as an ordinary scrotal hernia; in other cases, owing to the imperfect development of the scrotum, the hernia will tend to rise up and obtain a lodging under the integuments of the lower part of the abdomen.

(4) Owing to the narrowness of the external ring and the testicle blocking the canal, the hernia never descends out of the canal, but as it increases in size it distends the roof of the canal, and makes its way between the layers of the abdomen.

In the following case (M. Nicaise, *Rev. de Chir.*, 1888, p. 922) two of the above-mentioned conditions were combined, the testicle having gained a superficial position by separating the fibres of the external oblique, and the hernia a similar one by mounting upwards after passing through the external ring. The patient's age was forty-four. The right testicle had normally descended, but as a child the patient used to amuse himself by pushing it up, and one day it remained up and never descended. A hernia appeared on the same side ten years ago during an effort, and gradually increased in size, and became painful. It was always down. The right half of the scrotum was empty. In the fold of the groin there was a globular swelling, which was almost entirely reducible, thus allowing the external abdominal ring to be explored. After reduction of the hernia, there remained a small swelling a little above and outside the ring, movable, lying horizontally, and about the size of an almond. An horizontal incision was made over the tumour, and when the skin and cellular tissue were divided a thin sac made its appearance, the tunica vaginalis, without any communication with the peritonæum. Outside this was the atrophied testis, and next a soft yellowish swelling, which proved to be the cord enveloped in a large quantity of fat. Internal to the testicle was a larger swelling, the hernial sac, which, having passed through the external abdominal ring, had turned up upon the anterior surface of the aponeurosis of the external oblique, and become fixed there. The testicle and the cord appeared to have left the inguinal canal before reaching the external ring, by an abnormal separation of the external oblique aponeurosis. Thus, the testicle had nothing in front of it but skin and cellular tissue. The testicle and tunica vaginalis were removed, the cord being tied and divided close to the former.

While the above are of the congenital kind, there is another hernia which, though very rare, may accompany a retained testicle. It is the *the encysted hernia of the tunica vaginalis* of Sir A. Cooper, and is more commonly met with when the testicle is in its proper place. The funicular process being obliterated, and the tunica vaginalis of the retained testis thus shut off, a hernia enclosed in its own serous sac makes its way down as far as this point, and penetrates into the tunica vaginalis of the retained testicle, which yields to the pressure of the contents of the rupture.

Before leaving the subject of inguinal retention complicated with hernia, I would point out how readily grave strangulation may occur here, or in the allied variety, cruro-scrotal, owing to the narrowness of the canal, the numerous fibrous bands which overlie this region, and how serious is the constriction which the intestine must undergo if it suddenly make its way past a retained testicle or be forced through a narrow external ring into a scrotum imperfectly developed, and which it has to open up. The complication of hernia is much more rarely met with active life before him, an attempt should certainly be made to cure the hernia radically, and, if possible, place the testis in the scrotum. Unless there be an urgent reason to the contrary, such as miserably poor parents or a large hernia, the attempt should not be made before the third year. At this time the parts are rather larger and will hold sutures better, while the excreta are better under control and the child more easily kept from constant screaming. Where the hernia cannot be separated from the testicle in an adult, in whom the testicle is probably functionless, castration should be performed, which will expedite the radical cure of the hernia; and the same step should be taken, whatever is the age of the patient, where transplantation of the testicle is found impossible, or where this step has been tried and failed. If the hernia is inseparable from the testicle and reduction of both into the peritonæal cavity thus interfered with, and the patient refuses any operation, the only course will be to advise the patient to wear a truss with a large concave pad, with a view of protecting the testicle and at the same time preventing further descent of the hernia. But this course has the drawback of condemning the patient to an inactive life, while it rarely succeeds in entirely saving the testicle from irritation.

The following case is a good instance of a retained testicle, complicated with a hernia not yet strangulated:—

Left Inguinal Retention; Omental Hernia in Open Processus Funicularis; Excision of Omentum; Castration; Ligature and Removal of Sac; Recovery.—W. J., aged twenty-four, was sent to me in Feb. 1891 by Dr. Jaynes, of Bermondsey, with the following history:—He had always had a small swelling in the left inguinal region, and the testicle on this side had never descended. The swelling had always remained on the same side, and never troubled him till about three weeks ago, when it suddenly increased in size and became painful. On admission there was a large oval swelling in the left inguinal region, ill-defined, and dull on percussion. It reached from the external abdominal ring to within ¾ inch of the anterior superior spine, and measured 4 inches longitudinally, and 3 inches from above downwards. The lower part apparently contained fluid. In the centre could be indistinctly felt two bodies, one suggesting the epididymis, the other, more oval, the testicle, as when an attempt was made to seize it between the finger and thumb some testicular sensation was experienced. The left half of the scrotum was undeveloped. I advised exploration and castration for three reasons—(1) Owing to the age of the patient and the long duration of an inguinal retention, the testis was, probably, no longer serviceable. (2) The swelling was so large and so ill-defined, that while the feeling of fluid suggested a hydrocele, it was very probably, in part, hernial. (3) Above all, the corresponding part of the scrotum was ill-developed. March 3, A.C.E. mixture being given and the parts cleansed, the following operation was performed with strict aseptic precautions, including irrigation with a 1 in 2000 solution of hyd. perchl. An incision being made over the inguinal swelling, the overlying layers were found much thinned. All hæmorrhage was arrested with Spencer Wells' forceps, which also acted as refractors. On opening the lower part of the canal the funicular process was found to have descended to the external ring, and to contain here, not fluid as had been expected, but soft and unaltered omentum. On displacing this, a small testicle and epididymis very loosely attached to it were found beneath it. When traced upwards and pulled upon, the mass of omentum was found to be firmly adherent to the internal abdominal ring. The omentum, being unravelled and split longitudinally, was tied in two pieces, each piece being transfixed with stout chromic gut. By retracting the upper angle of the wound these ligatures were tied at the level of the internal ring. The cord was then transfixed, and secured in the same way. The sac was then separated from its adhesions to the parts around, and ligatured just below the internal ring. The wound being carefully dried out and insufflated with iodoform, sufficient drainage was provided by a small drainage-tube, which passed deeply from the internal ring to the very bottom of the scrotum, where it was brought out by a counter-puncture, and by a horsehair drain which passed more superficially from end to end of the incision. The canal and external ring were sutured over the drainage-tube with buried chromic gut. The more superficial edges of the wound were adapted with salmon-gut sutures. Sal-alembroth dressings were applied. The after-course of the case presented little worthy of note. When dressed for the second time—on the seventh day—the wound was all healed, save at one small point. By the eleventh day healing was complete. The patient went out, against advice, as it was desired to better ensure consolidation by further rest, three weeks after the operation. As his work was heavy, he was advised to wear a truss of light pressure. I have seen him twice since (the last time six months after the operation), and the condition of the parts was quite satisfactory.

The testis in this case weighed 340 gr., and no spermatozoa could be detected on microscopical examination.

The *operation* should be performed with strict antiseptic precautions, irrigation with 1 in 2000 solution of mercury perchloride being employed, and everything which comes near the wound being rendered absolutely aseptic. The incision must be sufficiently free to expose thoroughly the testicle and the hernia. The sac of the tunica vaginalis being opened, the condition of the testicle must be examined, where the patient is sufficiently on in years, and the testicle has perhaps become so altered as to make it doubtful whether transplantation will be followed by good results. Where, owing to shrivelling and fibroid change, this prospect is doubtful, castration should be performed, as this step will greatly facilitate the making the cure of the hernia thoroughly radical. The hernia is next explored, and any adhesions between its contents and the testicle either separated or cut away, after being secured with fine chromic gut. Any omentum should be tied in the usual way and removed, and any knuckle of intestine thoroughly reduced. The sac is then carefully separated from its surroundings, especially the cord, and secured by torsion or ligature. The testicle is then brought down into the scrotum, and the precautions fully given at p. 87 taken for relieving tension and securing the cord and the testis *in situ*. Before the testicle is fixed, a tunica vaginalis may be made for it by suturing the lower part of the congenital sac in which it lies. Where a cutting operation is much deprecated, and the patient quite young and with plenty of time before him, an attempt may be made to get the testis down into the scrotum by a kind of massage, which stretches the adhesions between the testis and the contents of the hernia until the testis can be placed in the scrotum. If it tend to ascend, it is then secured there by a carbolized silk suture, passed well into the testis, through the bottom of the scrotum, and tied over a pledget of gauze. The hernia is then reduced and kept up by a truss. While this method has succeeded in one case—under the hands of M. Tuffier*—it appears to me to be open to the following objections :—(1) No attempt can be made to cure the hernia radically. (2) If the adhesions between the testicle and the hernia are only stretched sufficiently to bring the testicle into the scrotum, we have no certainty either that they have or will give way, and thus future trouble with the hernia is, sooner or later, very likely. (3) The plan is a tedious and uncertain one; the testicle tends frequently to ascend during the process of massage, which has to be interrupted from time to time owing to the tender skin becoming painful.

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* *Traité Chir. de l'Ectopie Testiculaire*, par C. Duchesne, Observ. v. p. 40, and vi. p. 43. The patients here were aged two, the ectopia was a right inguinal.

In the description given above of the operation for hernia complicating a misplaced testicle, attention has been paid to the most common condition—viz., inguinal retention. In the following case (M. Quelliot, *Rev. de Chir.* 1891, p. 662) it will be seen that the retention was iliac, and complicated with hernia on one side. A lad, aged fifteen and a half, was admitted into the Hôtel-Dieu, at Rheims, complaining of being unable to work on account of pains in the abdomen. His testicles were neither in the scrotum nor the canals. On either side was a depression in the abdominal wall, reaching from the pubic spine to above the anterior superior spine, into which the fingers could easily be introduced. The testicles, very mobile, could be felt at the upper part of these depressions, which were apparently due to deficiency here of the deep layers of the abdominal wall. On the left side there was also a hernia, a globular swelling rising up and containing intestine when a strong effort was made. When this happened the finger lost contact of the testicle, which seemed deeply retained in the abdomen. The steps of the operation, Jan. 31, 1891, had three ends in view: (1) To cure the hernia; (2) to get the testicle into the scrotum, and to secure its retention; then (3) to remedy, as far as possible, the gap in the abdominal wall. An incision was made about a finger breadth above Poupart's ligament. On cutting through the external oblique peritonæum came into view. Attached to this was a process of the shape of a Phrygian cap, with its base communicating freely with the peritonæal cavity, and its apex enclosing the testicle and epididymis. The peritonæum being incised over the testicle, the peritonæal cavity was shut off with a pair of forceps. The edges of the peritonæum were then brought together over the testicle with a continuous catgut suture, so as to form a tunica vaginalis. In the same way a covering was made for the cord, the serous membrane being sutured closely to the elements of the cord, so as to leave no room for a hernia. Then, by means of the finger and forceps, an opening was made in the aponeurosis of the external oblique, and an incision being made over the upper part of the scrotum, a bed was made for the testicle by the finger. By a piece of silk passed through the serous covering of the testicle this was drawn down, and fixed to the bottom of the scrotum by passing the suture through the skin here and tying it round a roll of iodoform gauze. By Feb. 18 the wounds were healed. Four months later the hernia was cured and the gap in the abdominal wall was disappearing. The testicle was at the upper part of the scrotum, appearing to have contracted adhesions here. On moving it upwards it had no tendency to enter the ring, but passes in front of it. It was at least one-third larger than at the time of the operation.

I have hitherto spoken of hernia in its reducible form, and it remains to consider (B) **the Complication of a Strangulated Hernia with Misplaced or Retained Testis** (Fig. 11). To put the surgeon on his guard, attention has already been drawn to the fact that strangulated hernia may occur with any of the varieties of misplaced testis; but it is of course the co-existence of a strangulated bubonocele, or scrotal hernia, with a testis retained in the inguinal region, that is the most frequent and the most important. I have already pointed out (p. 73) how readily grave strangulation may occur in these cases, owing to the narrowness and inextensibility of the parts. The following are conditions under which strangulation is likely to be of especial gravity, owing to its acuteness. (1) When a loop of intestine descends suddenly past the testis into a portion of the funiculo-vaginal process of peritonæum, which remains imperfectly obliterated, or into the narrow external ring, or through this into the little-developed scrotum. In the latter case, if the scrotum be inextensile, the intestine, on emerging from the external abdominal ring, may ascend upon the aponeurosis of the external oblique, appearing in the groin as a superficial tumour reaching outwards from the external ring towards the anterior superior spine.* (2) When the canal is occupied and blocked by a retained testis, and a small knuckle of intestine squeezes into the internal abdominal ring.

Diagnosis and Treatment.—In deciding the nature of the swelling, and the necessity of an operation the surgeon must bear in mind the following:

The local condition presents for examination: (*a*) *The condition*

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* As in the case of Mr. Hulke's, quoted at p. 43, where an oblique inguinal hernia, together with abdominal retention of the testis, existed on each side.

of the scrotum. But here it is noteworthy that the presence or absence of a testicle (a most cardinal point) may be obscured by the presence of intestine, vas deferens, or epididymis, which have descended while the testis is still above; or by the effusion of blood or inflammatory products into the scrotum, from manipulation of the swelling above. This last, which is most perplexing, may be recognised by the ecchymosis of the scrotum when this co-exists. (β) *The character of the swelling in the groin.*—This may recall the definite and characteristic size and shape of a testicle contained in a tunica albuginea, allowance being made for enlargement due to past or present attacks of inflammation, and the natural feel and testicular sensation may be present. On the other hand, irregular shape, resonance to percussion, elasticity, or the feel of a granular uneven body, will point to intestine or omentum.

The history, which would *à priori* seem to be of great help in these cases, is sometimes rendered of little value owing to the obtuseness of the patient, natural, or brought about by acute and unwonted suffering. With reference to general symptoms, it has been already stated that when the surgeon has to deal with an inflamed retained testis, the symptoms, though acute, are chiefly local and yield readily to treatment. But, on the other hand, when vomiting, though intermittent, is persistent; when constipation is absolute, not even flatus being passed; when there is any tenderness or swelling of the abdomen, starting from one iliac fossa; and when there is much pain referred to the region of the umbilicus, the swelling is probably due to the presence of intestine, and an operation is urgently called for. When the inguinal canal has been sufficiently opened, any swelling that presents itself must be explored, and if no hernia is found in connection with the testicle, it must be sought for higher up in the canal. The seat of constriction* may be at either ring, or in the canal itself, and when high up, as at the internal ring, the surgeon must make quite sure that the intestine is entirely returned into the peritonæal cavity. In one case of acute strangulation, Mr. Wood (*Brit. Med. Journ.*, 1885, vol. i. p. 1235) found two deep hernial openings, one placed internally and filled up by adherent omentum; and the other, externally, being occupied by a knuckle of strangulated hernia lying over the cord and adherent to a very shrivelled testicle.

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* In notching this the surgeon must remember that in long-standing cases the relation of the cord to the hernia may be altered, and that the constituents of the former may be separated from each other and spread out around the sac. In a case recorded in the *Lancet*, 1859, vol. i. p. 630, where the right testis had never appeared, a swelling suddenly formed in the groin while the patient was carrying a weight of 107 pounds. During the operation small intestine and omentum were met with; and after the intestine was returned it was found that "the cord had been divided, it having so surrounded the external abdominal ring as to appear a portion of the stricture."

The next case is interesting, partly from its being an instance of that rare condition, double retention of the testicle. It will be seen that the patient was admitted with symptoms pointing to peritonitis, and that vomiting had continued for over three days, finally becoming stercoraceous:

Double Inguinal Retention. Strangulated Hernia Right Side. Operation for Radical Cure and Castration. Death five days later with Diarrhœa and Exhaustion.—R. D. V., aged thirty-two, admitted into Guy's Hospital February 11, 1891. In the absence of Mr. Lucas and Mr. Lane, I was asked to see the case. The scrotum was almost undeveloped. From birth a small lump had existed in each groin. Patient was married, but had no family. He always enjoyed good health till a year ago. At this time, when out walking, he was attacked with colic and became unable to walk, and found an additional lump in the right groin. A medical man reduced this and ordered a truss, which has never been bought. The swelling has returned several times, and has always been reduced. On the night of the 7th the patient, on getting out of a bath, found that the lump had come down again; the colic also now returned. A medical man was said to have reduced the swelling, but the patient was sick that night, and the next morning the swelling had returned. The same thing seemed to have happened on the 9th and 10th, and on the morning of the 11th, the vomit being dark brown and foul, the patient was advised to come up to the hospital. The patient has been sick constantly since February 7th, with the exception of the night of the 9th; the bowels acted for the last time then, and no flatus has been passed since. The patient was brought up in the afternoon with a full and tumid abdomen, a moist clammy skin, and almost pulseless. At 5 P.M., ether being given, the usual incision was made over the inguinal canal with strict aseptic precautions. On slitting up the canal, a bluish protrusion was found to be a congested processus funicularis, reaching about 1½ inches below the ring. On opening this process blood-stained fluid escaped; inside the sac a livid and congested testicle was found, and to the inner side, and above this, a knuckle of dark purple, almost black, intestine. This was very tightly constricted at the internal ring, but, as far as could be seen, there was no ulceration at this spot. The constriction being nicked straight upwards, the knuckle was returned without much difficulty. The cord being transfixed with stout catgut, was tied in two pieces, and the testicle thus removed. The sac being then separated from the adjacent part, and its neck tied with carbolized silk, was cut away. A large horsehair drain was then introduced, the upper end being brought out at the upper extremity of the wound, and the lower at the very bottom of the scrotum by counter-puncture. The wound was then brought together with sutures of fishing-gut and horsehair, the former being passed deeply so as to take up the aponeurosis of the external oblique on either side. Iodoform was insufflated and sal-alembroth gauze dressings applied, a pad of tow being placed over the anus so as to prevent sepsis of the wound by flatus, &c. The next day, February 12, the patient had rallied, and took fluid food well. He had passed flatus. February 13, the wound was dressed, and the drain removed. The abdomen was flat and moved naturally. February 14, the bowels acted loosely. February 15, loose motions were passed at 11 A.M., 3 P.M., 4 P.M., and at intervals up to 10 P.M., when they yielded to the sulphate of copper and opium which had been given. The patient was, however, extremely exhausted. This condition increased, and he sank at 5.30 on the morning of the 16th.

At the post-mortem examination the wound was healthy, and the communication with the peritonæal cavity quite closed. There was no evidence of peritonitis, beyond a few "suction lines" on the intestines. The loop of small intestine which had been strangulated was very dark in colour, and showed, within, numerous patches of acute enteritis. The lungs showed evidence of old chronic bronchitis, a good deal of pus exuding from the bronchioles. There was an old tubercular nodule at the left apex. On the left side the testicle lay just within the external abdominal ring, the epididymis being extended and reaching outside the ring, while the vas, much convoluted, lay above the testicle. The internal ring on that side was quite closed. Mr. Parkin, at that time Surgical Registrar, reported that no spermatozoa could be found in the right testicle.

Transplantation of a Retained or Misplaced Testicle into the Scrotum.—Orchidopexy.—I have above treated fully of the complications to which a retained or misplaced testicle is liable and their treatment; it remains to give a fuller account of the method of transplantation which has been developed of late years by French surgeons, aided by the antiseptic treatment. Two methods have been advocated—(1) **That by manipulation**; (2) **That by operation.** It is of the second that I shall chiefly have to speak. (1) **Transplantation by manipulation.**—The object of this is to stretch any adhesions * and to render the testicle sufficiently mobile to bring it below the external abdominal ring, to supplement the use of a truss, and, perhaps, to do away with the need of an operation. Light pressure is made with the finger tips from above downwards with an inguinal, and from below upwards with a perinæal testicle. This is practised every day, or once in two days, for five minutes at a time. If a hernia co-exist, this must be returned, and if it be adherent to the testicle, attempts must be made to fix the hernia while the testicle is drawn away from it.

The above cannot be relied upon to effect a cure. It is only to be recommended in very young children, as preliminary to an operation, where the parents are anxious that something be done, or where they delay giving their consent to an operation.

(2) **Transplantation by Operation.**—For practical purposes, this is the only one of the two methods which will be available. One or two preliminary questions arise here: What is the value of the retained or ectopic testicle? At what age ought the operation to be performed? These may be answered together. It will be seen by reference to the account (given at p. 45) of the condition of the retained or ectopic testicle, if nothing be done, that the following are certain: (*a*) That such a testicle ultimately becomes, and usually before adult life is reached, physiologically useless; (*b*) That, as some of the cases I have given show, during the early years of life the testicle, though ill-developed, may be capable under more natural surroundings of becoming a useful organ; (*c*) That the period in which the testicle passes from a probably useful into a useless state must be an uncertain one, varying with the attacks of inflammation, &c. Most French surgeons have advised deferring the operation until the age of about sixteen, as up to this time a retained testicle may still descend.† While this is true, I should strongly

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* Where these are present massage, from a practical point of view, will be a failure.

† M. Berger seems to have noted the following fact, that sometimes the

advocate resort to operation at an earlier date, a step which I have taken in the cases given below, on the following grounds: It must always be quite uncertain at what date structural changes marring the efficiency of a testicle have set in. These must depend on the number of recurrent inflammatory attacks, and children are certainly not exempt from these. Again, in cases complicated with a hernia, the longer an operation is deferred the more difficult will it be to ensure a radical cure.

Moreover, a condition of this kind, interfering as it may do with activity and enjoyment of life, schooling, apprenticeship, &c., should be put right as soon as possible. Finally, if the testicle's growth and development* are to be furthered by the transplantation, and this is one great object of the operation, it is surely more probable that this end will be secured by bringing the testicle into its natural home before puberty—that important epoch—and its consequent sexual changes have set in. I should prefer operating between the ages of eight and ten, though in the case of the children of the poor where time is of great importance, I should consider it quite justifiable to operate earlier, especially if there has been any attack of pain, or if a troublesome hernia co-exists. Before the age of two or three years the small size of the parts, their fragility as far as holding sutures go, and the difficulty of maintaining asepsis are contra-indications to operative interference.

The following account will be found to apply both to the case of a child and that of an adolescent. The bowels having been well moved for a day or two before, the parts duly cleansed† and shaved if needful, an incision is made with the external ring for its centre, as retention near this spot is the condition most frequently calling for operation. This incision can be prolonged upwards and downwards if needful, but needless weakening of the abdominal wall can often be avoided by dragging up or down

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testicle has a tendency, as the patient grows older, not to descend, but to disappear, retiring more and more into the inguinal canal.

* While in some cases the transplanted testicle remains hard and knotty, while in many it mounts up towards the external ring, there is no doubt whatever that in the most successful cases a distinct and healthy enlargement takes place within the next year. This will be aided by the operator taking the minutest pains to preserve untouched all the small branches of the spermatic artery and also the vessel with the vas.

† The delicate skin of the genitals (*e.g.*, the prepuce) may be smeared with salicylic cream and thus protected from irritation. Juillard advises that in cleansing the parts any lotions be used hot, so as to relax the scrotum and prevent its retraction.

the two angles of the wound with refractors, invaginating the scrotum, &c.

In cases of inguinal retention the testicle is often subcutaneous and is reached after division of the external oblique and intercolumnar fascia. The following points have now to be inquired into. What is the arrangement of the peritonæum? Is the serous sac which surrounds the testicle continuous with that common to the peritonæal cavity or separated from it by obliteration of the funicular portion in part? The sac around the testicle or any prolongation upwards having been opened, the above question is settled. If the peritonæal process is open, it should be divided circularly with great care, so as to avoid the cord, a little above the testicle. While the lowest part, thus left, is fashioned by a few catgut sutures into a tunica vaginalis, the upper part is freed most carefully from its surroundings as high as the internal ring where it is secured by ligature or torsion, as the surgeon prefers. If the peritonæal canal is found to be closed in the inguinal canal and above the testicle, it must be treated by the steps already given after its closed lower end has been found and the process freed. Care must always be taken to extirpate this process as far as possible and to close it thoroughly, as by this precaution an important obstruction is placed in the way of the testicle's remounting. Is a hernia present? If so, any adhesions to the testicle being separated, this is returned in the usual way. But the presence of a hernia must always, especially where there is any doubt as to the condition of the testicle, incline the surgeon to sacrifice the testicle and his hope of transplantation, and thus make sure of radically curing the far more important trouble. Will it be possible to bring the testicle satisfactorily down into the scrotum? How best will it be retained there? All adhesions[*] should be divided as freely as possible, the position of the cord being first defined. Where the cord seems at first short, careful, sustained, downward traction will often be of much assistance.[†] When the testicle has been, if needful, coaxed or pushed through the external ring, a bed must be prepared for it, if needful, with the finger in the scrotum. This is then invaginated with the tip of a finger and the tissues thus presented sutured to the testicle with aseptic silk or chromic gut. The suture should be of silk* in cases where the operation is performed at or after puberty. In earlier cases chromic gut will perhaps suffice, though I prefer well carbolized fine silk. The suture should always be passed boldly, dipped well into the connective-tissue of the invaginated fundus scroti on the one hand, and into the tunica albuginea of testicle or the tail of the epididymis† on the other. I prefer this method of invagination to that of passing the suture through the scrotum from without inwards, then next into the tunica albuginea, then out of the scrotum again, and tying the ends over a pad of gauze. Finally, when the testis is *in situ* the cord should be sutured to the pillars of the ring with fine catgut or silk, the vas and the spermatic artery also if possible being made out and inspected. Then this ring should be carefully closed with fine silk, its pillars being first defined. The tendency of the testicle again to enter the vaginal canal is often so persistent and so marked,‡ that not one of the following precautions should be omitted, viz.:—(1) Obliteration of the funiculo-vaginal process. (2) Separation as far as possible of any adhesions which prevent the transplantation of the testicle. This should include division of any bands of the cremaster, or of anything which can keep back the testicle, the cord alone being respected. (3) Suture of the testicle to the fundus scroti. (4) Suture of the cord to the pillars of the external ring, and closure of this opening. (5) In three cases to overcome the tension, Mr. Wood carefully dissected through the connective tissue attaching the testicle to the globus major so far down as to enable him to turn the testicle upside down with the lowest part of the epididymis still attached to the testis. By this means the length of the testicle (1½ inches) was gained, and the testicle lay without further strain topsy-turvy in the scrotum, the cord and epididymis being above it. This step, aided by antiseptic details and proper drainage, was followed by perfect success.

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[*] These are chiefly of two kinds: (α) those uniting the testicle in its tunica vaginalis to adjacent parts and (β) those attached to the cord. Occasionally adhesions are met with uniting the testicle and its sac to the conjoined tendon, or the intercolumnar fascia.

[†] In some cases this will be facilitated by the stretching or unravelment which the epididymis has undergone from the testis.

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* The following case may perhaps be thought to bear upon the substance used as suture. But I think it is clear from the original account that the patient was extremely neurotic, the sharp ascension of the testicle after operation pointing to this. M. Gérard Marchant (*Bull. et Mém. de la Soc. de Chir.*, 1891, p. 477) related the following case. In 1887, a patient, aged seventeen, presented himself with an ectopic testicle and vaginal effusion. On account "of the continous pain" a surgeon performed radical cure of the hydrocele and fixed the testicle in the scrotum with silk. For two years cure seemed to be maintained, but in July, 1889, the pains returned. Another surgeon stated that the hydrocele had returned and that the testicle had remounted, dragging with it the skin of the scrotum to which it was fixed. This surgeon obliterated the funiculo-vaginal canal, freed the cord very completely, and replaced the testicle at the bottom of the scrotum. Soon afterwards the patient was seized with fresh pains. The testicle was in its normal position, but on the slightest effort it was sharply drawn up and struck the abdominal wall. There were two little hard nodules, one at the anterior part of the testicle at the point of fixation, the other at the head of the epididymis. No other treatment succeeding, castration was performed. Microscopical examination showed that no spermatozoa or spermatoblasts were present, and that the two nodules consisted of fibrous tissue, in the centre of which were *débris* of the silk threads which had been used for fixation.

† Practically, no doubt, the suture is carried into the gland tissue itself. The greatest care should be taken to ensure that the silk has been properly prepared.

‡ M. Richelet mentioned (*Rev. de Chir.*, 1889, p. 698) a case of this kind. As the testicle ascended again it dragged up the scrotum with it, inverting this like the finger of a glove.

When the testicle has been fixed *in situ*, the wound is most carefully dried and dusted with iodoform. Sufficient drainage is then afforded by horsehair reaching from the upper angle of the wound to the bottom of the scrotum, where it is brought out by counter-puncture. The incision is then closed with sutures of salmon-gut and horsehair, which must not be tied too tightly. Either dry gauze dressings, or wet ones of boracic lint and boracic acid should be applied, according to the frequency with which the dressing will need changing, the age of the patient, the amount of cellulitis to be expected from the disturbance of the parts, &c. On the whole, my experience distinctly leads me to prefer dry dressings firmly bandaged on, even if they need frequent renewal, as safer. I have sometimes in these operations and in similar ones for radical cure of hernia in children, had the little patients slung by their legs and feet to a transverse bar above the cot, much as fractures of the shaft of the femur are sometimes treated by vertical extension. This position enables the child to be well looked to for cleanliness, while it keeps the intestines, in cases where a co-existing hernia has been operated upon, well away from the neighbourhood of the internal ring and the inguinal canal. To ensure firm consolidation, the patient must be kept recumbent for two months after the operation.

If there be any tendency for the testicle to rise, especially if much difficulty has been experienced in getting it into the scrotum, it will be wise to advise the wearing of a horseshoe truss of light pressure for a year or so after the operation. In two of Mr. Wood's cases a hernia appeared in the canal some months after the testicle had been transplanted. This had either been overlooked at the time or had formed subsequently. In one case radical cure was performed; in the other a truss was worn.

Inguinal Retention. Scrotum well developed and Internal Ring closed. Transplantation of Testis into Scrotum by Operation. Suture of Cord to Pillars of External Ring, this being also closed by Sutures. Testis stitched to bottom of Scrotum. Recovery, with Testis in good position.—F. B., aged nine. Right testis lay in the lower third of the inguinal canal. Scrotal pouch well developed. May 10, incision with centre at external ring reaching down into the scrotum, and upwards over lower third of canal. Processus funicularis ended just below the external ring, and contained a little fluid. On opening it it was found to be closed at the internal ring. Having been separated from the cord up to this point it was transfixed with silk ligature, tied in two parts and cut away. While this was being done the testis was kept drawn down into the scrotum, this being done with difficulty. The scrotum being invaginated, the testis was thus fixed in place with three silk sutures; two of these were passed deeply, taking a firm hold of the testis itself close to the head of the epididymis, and next, of the tissue on the inner aspect of the invaginated scrotum, the third, passed less deeply, fixed the head of the epididymis to the inner surface of the scrotum. The external ring was then closed with five silk sutures, one of which also passed through the cord, care being taken to exclude the vas. The wound was closed with eight salmon-gut sutures, a horsehair drain having first been passed from end to end and brought out by counter-puncture in the scrotum. There was still a good deal of tension on the cord when the operation was completed. The wound was dressed with sal-alembroth gauze, irrigation with hyd. perch, 1 in 2000 having been employed throughout. By the end of May, all the wound had healed except a small sinus at the uppermost part. This soon closed. To avoid any strain being thrown upon recently united structures the child was kept on his back till the end of July, when he was allowed to go out. The testis was in excellent position, and soft to the feel.

Inguinal Retention. Attacks of Pain in a Child aged four. Transplantation of Testis into Scrotum. Internal Ring patulous. Torsion and Ligature of Funicular Process. Closure of External Ring and Suture of Cord to the Pillars. Testis stitched to bottom of Scrotum. Recovery, with Testicle in good position.—W. A. M., aged four. Right testis had always been absent from the scrotum. Six months ago the child had a cough and used to complain of pain and swelling in his left groin. He was thought to have a rupture, but did not wear a truss. A month ago, after a blow in the same place, the child turned very faint and sick, and was ill for some hours. The left half of the scrotum was markedly less developed than the right, and much smoother. A small oval body, somewhat tender on pressure, could be felt in the left inguinal canal, about the centre. The fact that attacks of pain had already occurred led me to advise operation, though the child was so young. June 15, a free incision was made, with the external ring for its centre, reaching over the lower third of the canal above and opening up the scrotum below. The external ring having been slit up, the funicular process showed itself very clearly. On opening this a little fluid escaped, and a *tiny* testis of natural colour, and with a normal tunica albuginea, floated up. The condition of the epididymis was striking, large, loose, and flabby, and detached from the testis; it hung down from and below the testicle, like a hood. A minute hydatid of Morgagni projected between the two. At first there seemed to be no hope of getting the testis down into the scrotum, even if this step was likely to be profitable, but after prolonged extension had been made on the cord and funicular process, the outlook seemed better. The internal ring was quite patulous, a pair of Lister's sinus-forceps passing easily into the peritonæal cavity. The funicular process was separated from the cord as high as the internal ring (the upper angle of the wound being strongly retracted upwards), and having been twisted, was transfixed and tied with a carbolized double silk ligature and cut away. Tension being kept up on the cord this was secured with four fine silk sutures to the external ring, these being so fastened as to also close the ring. These retained the testis *in situ* fairly well, but allowed it to slip up about half an inch from the point to which it had been drawn down. The scrotum was now invaginated, and two fine silk sutures passed first through its inner layers and then deeply into the testis itself, close to the lower part of the epididymis. This fixed the testicle down well, but with some tension, as shown by the pucker, which now appeared markedly on the bottom of the scrotum. A third suture was passed between the invaginated scrotum and the epididymis. A horsehair drain was inserted and dry sal-alembroth gauze dressings applied. June 21, all the sutures and the drain had been removed. There was some slight suppuration in the upper part of the wound, pus quite sweet; 26th, the upper part of the wound has closed by granulation. The boy was kept quiet on his back till the middle of August and then discharged, with the testis in excellent position.

Treatment of Perinæal Ectopia.—Owing to the annoyance and risk of injury to which a testicle the subject of this misplacement is increasingly liable as life goes on, in sitting, bicycling, riding, &c., an attempt should always be made to place the testicle in its proper place, especially if the corresponding half of the scrotum be developed. It will be vain labour to try and effect this by a truss, or a pad and bandage, in earlier life, owing to the mobility of the testis, and the difficulty of keeping the parts clean, and later on by the serious interference which this would cause with the pursuits of daily life. Operative measures are abundantly justified in the hands of careful antiseptic surgeons. The following are instances of successful[*] transplantation:

A patient, aged three, under the care of Prof. Annandale,[†] suffered from pain in the region of the perinæum increased by walking or running. The right side of the scrotum was empty but well developed. The right testicle, also well developed, lay under the skin and cellular tissue to the right of the middle line of the perinæum. The cord could be traced down to it from the external abdominal ring. Pressure on the testicle caused much pain.

An incision, commencing over the external abdominal ring, and extending half-way down the right side of the scrotum, exposed the cord, by means of which the testicle was drawn out of its abnormal position. This necessitated the division of some adhesions; a fibrous band, attached to the bottom of the testicle above and the ischial tuberosity below, appeared to correspond to one process of the gubernaculum, and required to be cut across before the testicle would leave the perinæum. The scrotum was now opened up more freely, and the testicle placed in it, and securely fixed by a catgut suture passed through the bottom of the scrotum and lower part of the testicle. Before suturing the wounds in the groin, scrotum, and perinæum, a small counter-opening was made in the most dependent part of the latter, so as to allow any fluid to drain away.

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[*] The following pioneering cases, undertaken in pre-antiseptic days, led up to happier results. Mr. Partridge's (*Brit. Med. Journ.*, 1858, vol. ii p. 549), in which the attempted transplantation was followed by castration. Mr. Curling's operation (*loc. supra cit.*, p. 55) was followed by cellulitis and suppuration, and the child, a month old, died with diarrhœa and bronchitis two weeks after the operation, the parts having nearly healed, Mr. Adams (*Lancet*, 1871, vol. i. p. 710) introduced the precaution of suturing the transplanted testicle *in situ* with catgut; but this child, eleven weeks old, died in a fortnight of erysipelas and peritonitis, inflammation having extended from the tunica vaginalis along the open funicular process to the peritonæum.

[†] *Brit. Med. Journ.*, 1879, vol. i. p. 7.

The chief points to bear in mind so as to ensure success in the transplantation of a testicle, the subject of perinæal ectopia, would appear to be—(1) Deferring the operation till after the child is at least two years old. There is no risk that the scrotum will have atrophied by this time, and by putting off the operation the surgeon will be better able to keep his wound aseptic, as the evacuations of urine and fæces are now more easily managed than at an earlier date; the parts too are larger, and will hold sutures better. (2) The division of all adhesions. (3) Stitching the testis to the bottom of the scrotum with carbolized silk (p. 87). (4) Arresting all hæmorrhage before closing the wounds carefully, and providing for free drainage from the most dependent part of the cavity from which the testicle has been removed, so as to prevent all risk of tension, and so of suppuration in the parts above. (5) I cannot speak from any personal knowledge of transplanting testicles from the perinæum, but from my experience of operations for inguinal retention the dressing and the position recommended at p. 88 are worthy of trial here.

Where the above operation has failed, or when the surgeon is called to a case where a testicle in the perinæum is causing serious annoyance, the patient past the age of puberty, and the corresponding half of the scrotum either all along undeveloped or atrophied from the continued emptiness, it will be wiser to remove the testicle at once.

Treatment of Crural Ectopia.—Owing to the great rarity of these cases, this may be briefly stated. Whenever it is practicable, the testis should be returned within the abdomen and retained there with a truss. Where this is impossible, where crippling attacks of inflammation recur, in cases which call for exploration owing to the testis becoming inflamed and simulating strangulated femoral hernia, the testis should always be removed, and any hernial sac separated from the adjacent parts, tied high up with stout chromic gut and the remainder cut away. The operation must always be conducted with strict antiseptic precautions.

SECTION III.

ABNORMAL POSITION OF THE TESTICLE IN THE SCROTUM.

I. **Inversion of the Testicle.**—The testicle is said to be inverted whenever it occupies in the scrotum a position different from its normal one—*i.e.*, when it is not found slightly inclined forwards—its long axis directed from above downwards, and from before backwards, and its anterior border, free and looking downwards and forwards, its posterior, with the epididymis attached, looking upwards and backwards.

This rare anomaly, recognised by Sir A. Cooper in this country, and by Boyer in France, has been described later by Maisonneuve, and more fully by Royet (*De l'Inversion du Testicule*, Thèse, Paris, 1859), and by Le Dentu (*Des Anomalies du Testicule*, Thèse, Paris, 1869).

Varieties.—Of these, though numerous, only one is met with with anything like frequency. Inversion may be anterior, horizontal, lateral, or with the epididymis displaced in a more or less complete loop or circlet.*

(1) **Anterior Inversion.**—This is the most frequent of the varieties of this anomaly. According to Maisonneuve it is met with in one out of every fifteen or twenty cases. The position of the testicle is here exactly the reverse of that which is normally met with. Its posterior or attached border has become anterior, and its anterior or free border looks backwards. The epididymis still surrounding the posterior border has become, like this, anterior in position. The consequences of this alteration are obvious. The tunica vaginalis is situated behind and below, and if fluid accumulates here, the testicle will be pushed forwards. The vas deferens has become more superficial in position, lying not behind the testicle, but between it and the skin. This variety is the only important one; it never occurs on both sides simultaneously.

(2) **Horizontal Inversion.**—The long axis of the testicle is now horizontal instead of oblique, the posterior border, with the epididymis, looking upwards; the head of the latter may be in front, more usually it is behind.

(3) **Lateral Inversion.**—This is usually a sub-variety of the first. Thus, the testicle is in the anterior form of inversion,

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* All these anomalies will be found figured by M. Le Dentu (*loc. supra cit.*).

but the epididymis, instead of being behind, is placed a little to one side, usually on the outer one.

(4) **Inversion with the Epididymis displaced in the Form of a Loop or Circlet, more or less completely surrounding the Testicle.**—Here the long axis of the testicle is again oblique. (1) In one variety the loop is incomplete. The epididymis is attached only to one border, the anterior or posterior, its head is usually below, and the vas coming off above runs upwards to the external ring. (2) In the other variety, while the epididymis is on one border (its head usually above), the vas coming off below, instead of at once turning backwards before it runs upwards, passes up on the other border of the testicle before it leaves the gland, the testicle being thus surrounded with a complete loop of epididymis and vas.

Importance of Inversion.—In the anterior variety the altered position of the testis, epididymis and vas deferens may be important in dealing with such diseases as hydrocele, hæmatocele, epididymitis, and varicocele.

Thus, in hydrocele, the testicle being situated in front and pushed forward by the fluid just under the skin, will be exactly in a position to be wounded by tapping. This shows the importance of always, where possible, making sure not only where the testicle is, but where it is not, by the test of translucency and palpation, and, where the case still remains doubtful, of dealing with the case, not by puncture but by a careful exploratory incision. On one occasion, by neglect of this precaution, I saw the testicle punctured in tapping a hydrocele,* and on another, in an operation for hæmatocele, the gland severed by the stroke of the scalpel. In two cases of gonorrhœal epididymitis I have found the epididymis and vas deferens in front, and the posterior border of the testicle free and smooth. Mr. Curling met with one case of inversion in a large varicocele, the enlarged veins forming a swelling in the fore part of the scrotum instead of behind. In another very interesting case which he records, of a man with large tubercular deposits limited to the two epididymes, the swelling on the left side was, as usual, behind the gland, but on the right, the side of the inversion, it projected in front of the organ.

The Causes of Inversion.—Nothing precise is known of these.

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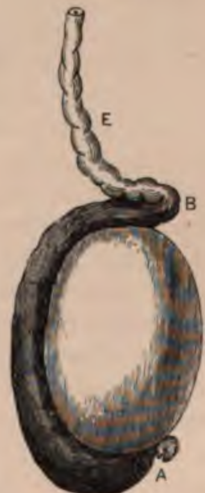
* MM. Monod and Terrillon advise that in tapping cases where the position of the testicle remains in doubt, the puncture should be made on the outer side of the scrotum, instead of in front.

The earliest observers (Sir A. Cooper and Boyer) attributed this anomaly to the existence of adhesions, and, thus, to inflammation.* It was thought that after tapping a hydrocele adhesions formed between the testicle and inner aspect of the tunica vaginalis in front, and thus the testicle was drawn forwards. But I am not aware that this is supported by any facts. If it were a *vera causa* it certainly should have been noticed, considering how often hydroceles are tapped, and that repeatedly. Inversion should also, according to this view, be found present *post mortem*, in some of those subjects in whom a hydrocele has long existed. Moreover, it is certain that whatever adhesions may be formed between the parietal and visceral tunica vaginalis after repeated tapping, must be usually filamentous, and give way before the pressure of the re-collecting fluid. M. Boyer (*Mal. Chir.*, t. x. p. 184) seems to have formed the above view from the experience of a case which he candidly relates, in which, on tapping a hydrocele, at the same spot as on a previous occasion, he penetrated the testicle. It is possible that this may have been an instance of "the temporary inversion" of M. Royet. A more likely hypothesis is that of Le Dentu, who holds that a faulty attachment of the gubernaculum is at the root of this anomaly. Thus, instead of being attached to the lower end of the testicle, he believes that the gubernaculum is inserted along the anterior border, or even to the upper end.

FIG. 12.



Reversion of the testicle, the lower end with the globus minor being uppermost. A, Head of the epididymis. B, Tail of epididymis. C, Front of testicle. E, Vas deferens. (Royet.)

ii. **Reversion of the Testicle.**—This term has been given to a condition of testis described by Godard.

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* M. Mercier explained the cause of inversion to inflammation in a different way. Holding that this process paralysed some fasciculi of the cremaster much as peritonitis paralyses the intestine, he goes on to say, "Les fibres du crémaster non paralysées agissent alors sur le testicle qui pivote autour de son cordon, et l'epididyme passe en avant." Against this view are the following points:—(α) That it is most unlikely for inflammation to partially pick out fasciculi of a muscle like the cremaster. (β) That inversion when present is permanent, instead of disappearing as it should do if caused by inflammation. (γ) That inversion is often present without any history of inflammation.

He observed it in the dissection of the body of a young man whose right testicle was lodged in the iliac fossa. The left testicle was in the scrotum, but its position was reversed, its upper extremity being directed downwards, so that the vas deferens sprang from the tail of an epididymis, which was here situated above the testicle. The vas was thus shorter than usual. Royet met with a similar case.

The diagnosis of this condition would be difficult, but as Mr. Curling points out, this is not important, as this disposition of the organ does not affect the relations of the tunica vaginalis to the testicle and epididymis.

CHAPTER III.

HYDROCELE.

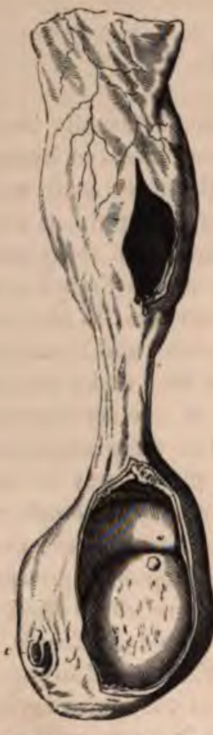
When this word is used, a chronic affection is usually implied. Before the chronic, and much more common, forms of hydrocele are discussed, mention must be made of the rarer acute variety of hydrocele. As this implies an inflammatory origin, it will be well, here, to speak of the relation of inflammation to hydrocele. With many foreign writers, especially those of the French school, it is becoming customary to speak of all effusions in the tunica vaginalis as inflammatory, and thus of hydroceles and hæmatoceles as vaginalites varying in kind. They argue that under the influence of inflammation, the serous envelope of the testicle undergoes modifications similar to those observed in other serous membranes. Thus, as an inflammation of the pleura may be dry or accompanied with effusion, and as this effusion may be serous, purulent, or bloody, so a vaginalitis may be in different cases, plastic, serous, purulent, or bloody. The three following main groups are accordingly described :—1. *Acute Vaginalitis or Acute Hydrocele.* 2. *Chronic Vaginalitis with Effusion, or Chronic Hydrocele.* 3. *Hæmorrhagic Vaginalitis, or Hæmatocele.* With regard to the relation of the above affections to inflammation of the tunica vaginalis, I shall return to this subject again as far as it concerns the most common of them, vaginal hydrocele. I will merely point out now that there is not, in reality, any close analogy between the diseases of the pleura as one serous membrane, and those of the tunica vaginalis as another. This is shown in several ways. One fact will occur to many—viz., the frequency with which a pleuritic effusion passes into suppuration, and the rarity with which this change takes place in effusions in the tunica vaginalis. Later on, I shall have occasion to show that it is a mistake to speak of plastic inflammation occurring frequently in the tunica vaginalis. Finally, while acute pleurisy is usually primary or idiopathic, acute vaginalitis or acute hydrocele very rarely is so.

SECTION I.

ACUTE HYDROCELE.

The occurrence of this is secondary to wounds, punctured or contused, the different forms of epididymitis, orchitis, the injection of the tunica vaginalis, the use of a seton, erysipelas and other inflammatory conditions of the scrotum. Of the above causes by far the most frequent is acute and sub-acute epididymitis, especially the form so commonly met with in gonorrhœal urethritis. This frequency of some degree of acute hydrocele in epididymitis is readily explained by the fact that only sub-serous cellular tissue lies between that portion of the visceral tunica vaginalis which covers the epididymis and the epididymis itself. On the other hand, the comparative rarity of acute hydrocele with orchitis may be accounted for by the fact that immediately beneath the sub-serous cellular tissue lies not only the structure of the testicle itself, but the strongly resistant and protecting tunica albuginea.*

FIG. 13.



This figure (Hunterian Museum, No. 4144) shows the effects of inflammation of the tunica vaginalis after the application of caustic. The sac is cut away in part to show the swollen state of the epididymis. The visceral layer over the testicle and epididymis is coated with lymph. 1, Shows the aperture made by the caustic; above is the sac of an inguinal hernia. (Curling.)

Much rarer causes of acute hydrocele may be met with in the course of some of the specific fevers which occasionally attack the testicle as well. Thus, in small-pox we may sometimes meet with orchitis, sometimes with inflammation of the tunica vaginalis alone.

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* Gendrin (*Hist. Anat. des Inflamm.*, t. i. p. 64) first drew attention to the fact that when the sub-serous cellular tissue extends directly into a contiguous organ, as it readily shares in the inflammation of the serous membrane above so it as readily transmits this inflammation; but when this sub-serous cellular tissue meets with some tissue very different to itself, its power of propagating inflammation is checked.

This may also be the case in mumps. In rheumatism, again, sometimes the substance of the testicle itself, sometimes its serous covering, is attacked. This matter will be again alluded to under Epididymo-Orchitis, chap. vi. Other rare instances of acute hydrocele are seen in those cases where an infantile or congenital hydrocele becomes acutely inflamed from an attack of erysipelas. According to Monod and Terrillon, acute vaginalitis may occasionally follow upon affections of the cord, as when an inflamed varicocele propagates the inflammation by means of the epididymis to the tunica vaginalis. It has been held by some (*e.g.*, Gosselin, *Clin. Chir.*, t. ii. p. 636) that hydrocele may rapidly follow on the passage of a catheter, or on excessive masturbation. It is probable, however, that some irritation or contraction of the deep urethra, and thus some latent inflammation of the epididymis, is at the root of these cases.

Dr. Bond, of Leicester, has recorded (*Lancet*, 1885, vol. i. p. 748) a very interesting case in which an acute hydrocele occurred together with acute pleurisy and pericarditis. The patient, aged sixty-five, a hedge-cutter, first felt sharp pain in the right tunica vaginalis five days before admission. This was followed in a few hours by rapid swelling, so sudden indeed that the patient thought he was ruptured. Two days later, he complained of pain in his chest and shortness of breath, and gave up work. On admission, three days later, there was evidence of acute pleurisy on both sides of the chest, and of consolidation of the lower part of the left lung. The right tunica vaginalis was distended with fluid and very tender. The patient died three days later from the pneumonia and rapid pericarditis. At the autopsy both pleuræ showed recent lymph, but contained very little fluid. The pericardium was also coated with recent lymph, and contained 2 ounces of semi-turbid serum. The right tunica vaginalis contained about 2 ounces of clear serum, and the surfaces were coated with recent lymph, a quarter of an inch thick. The testicle itself was neither swollen nor altered in colour or consistence, and the cord appeared normal. The other organs and serous membranes were healthy.

In this case a healthy man (his only previous illness had been an attack of rheumatism one year previously) suffered suddenly, without any blow or enlargement of the testicle, from rapid and acute inflammation of the right tunica vaginalis, followed later by acute pleurisy and fatal pericarditis. The acute inflammation of the tunica vaginalis here was probably part of the general inflammation, having common cause with it. This view is supported by the absence of any other cause, by the similarity of the appearances found in the three serous membranes, and perhaps by the presence of the organisms considered by Friedlander to be characteristic of pneumonia. These Dr. Bond found not only in the pneumonic lung, but also in the pleural fluid, and, what is especially noteworthy, in that of the hydrocele. Dr. Bond suggests that the pneumonia was primary, and the other affections secondary, due perhaps to an escape of the organisms. He allows that, if this view be correct, it is strange that, with so many cases of pleurisy, the tunica vaginalis is so very rarely affected. Septicæmia and a septic origin of the hydrocele were negatived by the clinical and pathological evidence alike. With the history of a previous attack of rheumatism, and the inflammation here of three serous membranes, the rheumatic element cannot altogether be left out of sight in the explanation of the acute hydrocele.

Pathology and Varieties of Acute Hydrocele.—In inflammation of the tunica vaginalis the changes are in some respects similar to those met with in other serous membranes. Thus it rapidly loses its smooth and glistening appearance, becomes extremely vascular and covered by a layer of soft "lymph," richly corpuscular, with cells of various forms. Flakes of this lymph, becoming detached, fall into the fluid, which at the same time is poured out into the cavity of the tunica vaginalis. The fluid of such an acutely inflamed serous sac differs as much from that of ordinary hydrocele as the richly corpuscular and spontaneously coagulating fluid of acute pleurisy differs from the fluid of hydrothorax. The prognosis, on account of the tendency to absorption, is correspondingly good. Where the effusion of fluid is the chief feature, the vaginalitis is called *Serous*. On the other hand, where the amount of fluid is slight, and the corpuscular lymph is organised into fibrous tissue, adhesions form over more or less limited areas, and the vaginalitis may now be termed *Plastic*. These adhesions may clear up completely, or if well vascularised, become organised, and persist. Finally, where the inflammation was higher and persists longer, where the general health is not satisfactory, or where an acute inflammation, *e.g.*, from a blow, supervenes on an old hydrocele, the vaginalitis may be *suppurative*.

The **Symptoms** and **Treatment** of acute hydrocele are so much bound up with the diseases to which this affection is secondary that there is no need to repeat them here. The **sequelæ** are absorption, passage of an acute into a chronic condition, and suppuration.

HYDROCELE.

Classification.

HYDROCELE.

- i. Of the testis.
  - (α) *Hydrocele of tunica vaginalis.* The fluid is in a sac connected with that of the tunica vaginalis.
    - 1. *Ordinary hydrocele.* The fluid distends the closed sac of the tunica vaginalis (p. 102.)
    - 2. *Congenital hydrocele.* A communication exists between the cavity of the tunica vaginalis and that of the peritonæum (p. 162).
    - 3. *Infantile hydrocele.* The tunica vaginalis and the funicular process are distended with fluid, but these are shut off from the peritonæal cavity by an obliteration placed, usually, at the external ring (p. 169).
    - 4. *Inguinal hydrocele.* Hydrocele in relation with a retained testis (p. 62).
  - (β) *Encysted hydrocele.* The fluid is in a sac, distinct from that of the tunica vaginalis.
    - 1. *Encysted hydrocele of the epididymis.* The fluid is encysted in the neighbourhood of the epididymis (p. 186).
    - 2. *Encysted hydrocele of the testis.* The fluid is encysted between the tunica albuginea and the inner surface of the tunica vaginalis (p. 202).
- ii. Of the cord.
  - (α) *Diffused.* The fluid forms a serous collection of the nature of œdema in the cellular tissue of the cord (Part II.).
  - (β) *Encysted.* The fluid is contained in a distinct sac, originating usually in (1) some unobliterated part of the processus funiculo-vaginalis; (2) in a cyst formed independently of this process—*e.g.*, in dilatation of persistent tubules of the organ of Giraldès (Part II.).
- iii. Complications of hydrocele.
  - (α) *With other co-existing hydroceles* (p. 123). *E.g.* (1) hydrocele of the tunica vaginalis with encysted hydrocele of the testis; (2) hydrocele of tunica vaginalis with encysted hydrocele of cord; (3) hydrocele of the tunica vaginalis with diffused hydrocele of cord.
  - (β) *With hernia* (p. 127). *E.g.* (1) hydrocele of the tunica vaginalis with inguinal hernia; (2) hydrocele of the cord with inguinal hernia.
- iv. Hydrocele of the sac of a hernia (p. 207).

SECTION II.

HYDROCELE OF THE TUNICA VAGINALIS, COMMON OR VAGINAL HYDROCELE.

By the above term is meant a collection of serous fluid in the sac of the tunica vaginalis. Until this fluid, of which, normally, only sufficient is formed to keep the parietal and visceral layers moist, has collected in quantity, it is a mistake to speak of "the cavity of the tunica vaginalis," the two layers being in contact and gliding freely upon each other.

Causes of Hydrocele.—Considering the frequency of this affection, these are still somewhat obscure.* In a certain number of cases, the collection of fluid, as we have seen (p. 98) may be called acute hydrocele—*e.g.*, after a blow, or acute epididymitis. Again, when a vaginal hydrocele occurs in connection with the irritation of a syphilitic or tubercular testis, with an orchitis coming on slowly after an injury, in association with an epididymis remaining enlarged from some unhealed urethral cause,† or with a testicle enlarged by new growth, or is due to the escape into the tunica vaginalis of a small encysted hydrocele or one of the little bodies very rarely found loose in the sac of the tunica vaginalis (p. 213), it may be correctly said to originate in irritation, a condition akin to inflammation and easily passing into it. In the same way, in a few cases, the existence of a vaginal hydrocele may be explained by the co-existence of a urethral stricture, the irritation reaching the tunica vaginalis by means of the vas deferens and epididymis.† But the infrequency with which patients the subjects of ordinary hydrocele, whether in hospital or private practice, suffer from stricture, the extreme rarity with which the subjects of urethral stricture suffer from hydrocele, show, I think, that the above causation of hydrocele can only exist in a very small number of cases.

In another small group of cases, the presence of a hydrocele may be partly explained by the pressure of an ill-fitting truss or of a large hernia. In like manner, the hydroceles which are met with so frequently in elephantiasis of the scrotum may be due to the much-retarded venous current.

Another explanation is that of MM. Monod and Terrillon *Malad. du Testicule*, p. 154), that the serous cavity of the tunica vaginalis is merely a large lymphatic space, and is, accordingly, affected like the lymphatic spaces of the skin of the scrotum and lower extremities.

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* The obstinacy or even the virulence of some hydroceles when associated with tubercular disease of the epididymis and testis will be alluded to later in the chapter on Tubercular Disease of the Epididymis and Testicle.

† This is the explanation of those hydroceles which have been described by some writers, *e.g.*, Sir E. Home, as due to stricture. Those French surgeons who hold that hydrocele is always secondary to diseases of the testicle or epididymis hold that these have been too much overlooked. The patients' attention is only drawn to the epididymis or testicle while these are painful; the epididymitis or orchitis subside, but fluid is slowly formed, for while the inflammatory mischief is active it has spread to the tunica vaginalis.

Another ingenious explanation of hydrocele and its tendency to appear after middle life was that of M. Panas, who believed that chronic inflammatory induration of the epididymis (usually to be made out after the evacuation of the hydrocele) was the cause of the hydrocele, and was itself to be referred to alterations in the prostate, and prostatic urethra, which are so common in patients who have passed middle life. This view, however, is not in accordance with facts. Troubles referred to the prostate and neck of the bladder are only met with in a small proportion of the subjects of hydrocele, and the thickening above referred to by M. Panas is also by no means constant, and when present is not due to old inflammatory thickening of the epididymis itself.

It will be seen that it is but a small proportion of the cases of this common disease in which we can explain their causes and starting-points satisfactorily. This small group may be called (A) **Secondary Symptomatic Hydroceles** because they point to the existence of other disease, in the testicle or elsewhere. The second and much larger group, where the disease commences insidiously and painlessly without any known cause, would be called (B) **Primary Idiopathic Essential Hydroceles.** With regard to the real causation of these we are still in the dark. And when it is remembered that this is not a fatal disorder, and that we very rarely have opportunities of examining its early stages, the above is not to be wondered at. **Two main views** have been held as to the origin of vaginal hydrocele. According to one, hydrocele is inflammatory in origin, and from the first is set up by some disease of the testicle, &c. According to the other, hydrocele is akin to a passive effusion or a simple dropsy, not inflammatory in origin or causation, though the fluid may come to have the characters of inflammation later on. The inflammatory origin has been especially supported by French surgeons, many of whom would go so far as to say that all hydroceles are inflammatory in origin, and therefore secondary to mischief elsewhere, and would therefore do away altogether with the second of the above groups or Primary Idiopathic Essential Hydroceles.

Let us see what are the chief arguments on either side. Those who hold that **hydroceles are always inflammatory** in origin, though the degree of inflammation is slight and insidious, as when it dates to slow changes in the tunica vaginalis, do so on the following grounds:—

(1) There is nearly always evidence of a vaginalitis to be found in the tunica vaginalis. To this inflammation of the

serous membrane hydrocele is secondary, the vaginalitis being in its turn set up by insidious inflammation of the testis or epididymis, or by slight but often repeated irritation of these parts. It has been shown above (p. 102) that in a small number of cases the hydrocele is secondary to changes in the tunica vaginalis set up by disease of the testicle and epididymis. French writers have gone much further than this, and have endeavoured to account for the insidious onset of most hydroceles by ingeniously suggesting instances of the way in which slight and unobserved inflammation may fall upon the tunicæ vaginales. Thus Réclus (*Dict. Encycl. des Sci. Méd.*, t. xiv. p. 570), while rejecting the idea of "Idiopathic" Hydroceles, and holding that all are inflammatory, admits that the inflammation which causes them is not always tangible. He holds that brief congestions and repeated slight contusions may leave their traces on the tunica vaginalis, the serous lining of which is thus altered in an insidious manner. He talks of habitual irritations not perceived, alludes to the influence of frequent contractions of the muscles of the abdominal wall, which lead to collections of blood in the sub-serous capillary network, thus provoking inflammation of a slight degree and not perceived by the patient. M. Réclus also includes in the pathology of hydrocele, chronic affections of the urethra, slight narrowings causing chronic catarrh, since these may cause slight continuous irritation, which, descending along the vas deferens, gradually reaches the epididymis, and slowly brings about interstitial sclerosis of its connective tissue, and so, later on, attacks the tunica vaginalis. In support of the view that a vaginalitis is at the root of all hydroceles, M. Réclus mentions the result of examination which he made in 244 cases at the Bicêtre Hospital. Of these in-patients, with an average age of 67, about one-third had hydroceles, larger or smaller, usually the latter. In all the cases of hydrocele, more or less extensive adhesions were found at the same time. The appearance of these false membranes varies extremely, sometimes they take the shape of thin, friable, delicate layers, traversed by new vessels; these layers, meeting others, divide the originally single cavity into several, which may be independent or intercommunicating. Sometimes they are bands, not layers, hard and rigid, more like the chordæ tendineæ. At other times the vaginalitis is shown by thickened fibrous plates, cartilaginous to look at. The influence of these adhesions and false membrances in the cavity of a hydrocele is further alluded to at p. 111.

Other points brought forward by those who support the inflammatory origin of hydrocele, are—(1) The large proportion of albumen in the fluid, greater than that present in ordinary dropsies. (2) The frequency with which a fibrinogenous substance is met with in the fluid. (3) The absence of any marked tendency to hydrocele in those cases which would seem likely to predispose to it if it were a simple passive effusion—viz., cardiac disease and large varicoceles.

Let us now see what evidence there is in favour of the view that **many hydroceles are not inflammatory**, in any sense of the word, in origin, but are to be considered passive effusions—*i.e.*, primary idiopathic essential hydroceles. (1) It may justly be disputed whether there is really that evidence forthcoming which is needful to prove the existence of a vaginalitis and changes in the testis and epididymis to which all hydroceles are secondary. It must be remembered that this is a disease which affects all ranks of life, and that in many cases of hydrocele the patients are well known for years to their medical attendants. It is certainly very strange, that as they come back from time to time to be tapped the testicle is found not enlarged, and moving freely in its sac, and no complaint is made of urinary troubles, and nothing whatever is known about the origin of the complaint, save that it was noticed to be slow, gradual and insidious. As to the frequency of adhesions and hydroceles in bodies examined, I am again at variance with such observers as I have quoted—*e.g.*, M. Réclus. During the six years in which I was demonstrator of anatomy, and during the eight in which, somewhat later on, I was giving classes in operative surgery, I took every opportunity of examining this point, the subjects being mostly elderly, and from workhouses, just those in whom, if a hydrocele existed, it would not have been treated, but left to itself. I have only to say that out of 150 subjects I only found a hydrocele in four, and in one of these it was an encysted one, and in the other three there was no alteration of the tunica vaginalis. Of vaginalitis there were practically no traces or evidence, unless a few trivial adhesions usually met with at the upper and lower part of the epididymis could be so described. Again, a few years ago, the treatment of hydrocele by incision came largely into vogue. In all the cases published, there is practically no mention made of false membranes, old hæmorrhage, &c. In eighteen cases, in which I have employed antiseptic incision and partial excision of the sac, there was no trace of any alteration in the serous lining beyond a few quite unimportant adhesions, present in the shape of filamentous cords, in three of the cases.* I would go further and say, that I am strongly of opinion that if vaginalitis, with its false membranes, &c., were so common in hydroceles, these would be converted into hæmatoceles far more frequently than is the case, and that if the inner surface of the tunica vaginalis were so frequently altered and the seat of inflammation in hydrocele, radical cure by injection of iodine would be far more easily secured than is the case. For it is notorious that a degree of inflammation too slight to bring about a permanent cure is what too often follows this method, a result which is, I believe, due to the inner surface of the sac being healthy and not so susceptible to inflammation as if it were already the seat of false membranes with their new vessels, &c. Again, if false membranes were as frequent and as marked a feature as French surgeons represent, translucency would surely not be the easily obtained symptom that it is in the very great majority of cases. (2) In answer to the argument that the large amount of albumen present in hydrocele fluid points to an inflammatory origin, it may be replied with truth that no collection of fluid (however originating), in a sac situated like the tunica vaginalis, could long exist or attain any size without being exposed to so much disturbance and irritation that the fluid would soon assume characters assimilating it to one originating in inflammation. Thus the presence of albumen, of fibrinogen, and even of little flocculent masses floating on the liquid, would be accounted for. (3) The fact that hydroceles are infrequent in cases of general anasarca, cardiac disease, and large varicoceles, is, at first sight, against the theory of a merely dropsical origin. But, on the other hand, with regard to the first two diseases, the inactive life and recumbent position must be remembered, while as to large varicoceles, the frequency with which some form of support is often made use of is not to be lost sight of.†

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* I ought to add that H. Genziner, a pupil of Volkmann's, has gone so far as to say that injury is a common cause of chronic alterations in the tunica vaginalis and of effusion of fluid. He bases this opinion on the fact that he has very commonly found traces of old hæmorrhage when hydroceles have been laid open by the method of Volkmann. But I do not think that this experience will coincide with that of English surgeons.

† Furthermore, just as in a varicose condition of the veins of the lower extremity, the blood current can still be carried on by the deep veins, so in varicoceles, however marked the enlargement of certain veins be, there is always a sufficient number of small veins unaffected to carry on the slowly moving venous current.

To the above arguments two more may be added. One is, the frequency with which hydroceles occur in hot climates.* The other is the entire absence of any history of inflammation in the great majority of hydroceles.

Hydrocele of the tunica vaginalis usually commences insidiously and without pain, the attention of the patient being usually only drawn to the increasing size of his scrotum. This is not the history with which any affection, did it own an inflammatory cause, would be noticed to begin, in a region with such sensitive surroundings as the tunica vaginalis.

I consider that in the great majority of cases the effusion of fluid commences passively, and without any irritation or inflammation to begin with, the causes predisposing to its production being the pendent position, the less vigorous condition of the cremaster and dartos, feebler cardiac circulation, deficiency of tone in the scrotal blood-vessels, and lymphatics, together with, perhaps, a tendency to venous congestion from hepatic and renal degeneration. All these conditions, which combine to bring about a passive effusion, are naturally most active in middle life, this being the age when the ordinary hydrocele of the tunica vaginalis is most frequently met with. After a while, as the fluid increases in bulk, it becomes, from exposure to friction, &c., liable to irritation and inflammatory changes, which show themselves both in the fluid and sometimes in the tunica vaginalis itself.

Characters of the Fluid of Ordinary Hydrocele.—This is closely allied to serum, neutral in reaction, and of specific gravity of an average of 1·022 to, or 1·024. It contains rather less organic matter than serum, though more than the fluid of ascites and hydrothorax, the amount of albumen in hydrocele fluid being about 6 per cent., in that of ascites 4·25. It is odourless, without sediment, transparent. It is never colourless, being usually pale yellow, citron, or amber, more rarely yellowish-brown. Not infrequently it is of a greenish tinge, and occasionally darker in tint from the admixture of blood due to an injury received previously in a tapping. In these cases the tint will be rosy or dull-red, brownish, or like coffee-grounds, when, in long standing cases, the colouring matter has been precipitated.†

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* It should, however, be stated that it is disputed whether in these cases the hydrocele or a provoking orchitis is primary.

† In cases of jaundice, the fluid is said to be charged with the colouring matters of the bile. Dr. Dennis of New York, has stated, on the authority of

The limpidity of the fluid is generally remarkable. Occasionally the fluid is syrupy in consistence. In certain long-standing cases cholesterin is present in minute pearly scales; at first diffused through the fluid and giving it a glistening appearance, and then, by rest, slowly subsiding. The origin of this substance here is not yet fully known. It seems to be more common in long-standing cases, though I have seen it present in a case in which only two months had elapsed since the last tapping. Its presence in the hydroceles of old subjects is also to be attributed to the same cause, the long duration from the unwillingness of the patients to have anything done. Virchow attributes the origin of the cholesterin to a fatty degeneration and shedding of the inner surface of the sac. From this fatty metamorphosis crystallisation results, and thus the cholesterin. The practical importance of cholesterin is that, if present in large amount, together with thickened tunica vaginalis and perhaps an enlarged testicle, it may obscure the diagnosis.

Finally, hydrocele fluid contains a marked amount of sodium chloride and of the alkaline carbonates.

Microscopically nothing is found in hydrocele fluid beyond a few epithelial and blood cells, and occasionally the above crystals.

It remains to examine how far the characters of the hydrocele fluid support its origin as an inflammatory and not a merely dropsical fluid. (1) It coagulates abundantly, owing to its richness in albumen, as shown by the usual tests—heat, nitric acid, &c. (2) The amount of solid substances dissolved in it is far greater than in any ordinary dropsical fluid. (3) Unlike any of these fluids, it contains fibrinogen,* it being on the presence of this body in hydrocele fluid that its coagulation depends when the blood or other fibrin-ferment containing body is added. As I have stated at p. 106, the presence of these characters do not prove the inflammatory origin of ordinary hydrocele; it is much more probable that they have been acquired in the course of the disease, owing to the surroundings of the part affected.

Amount of the Fluid.—Eight to ten ounces is a common amount. It is usually under a pint. The largest amount which

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Prof. Welsh, that the fluid of some hydroceles contains indigo-blue, perhaps from the decomposition of indican.

* The amount of fibrinogen in hydroceles is always small, thus explaining their fluidity. Their fluid only coagulates spontaneously when they are acute, and therefore inflammatory in origin.

Mr. Curling met with was 48 ounces. The hydrocele of Gibbon, the historian, is still probably without a rival in this country, the quantity removed by Mr. Cline in that case being 6 quarts. In a case of Maisonneuve's, the tunica vaginalis contained 21 litres; in one operated on by Breisson, 16 litres when first tapped, and 26 on the second occasion, ten months later. Mursinna[*] (*Neue Méd. Chir. Beobact. Berlin.* 1796) gives the dimensions of an enormous hydrocele, which was 27 inches in its long axis, and 17 in its transverse. The late Mr. Mason showed a patient, aged forty-nine, to the Medical Society, whose hydrocele, of fifteen years' duration, measured 31 inches transversely, and 16 in the antero-posterior direction.

Changes in the Tunica Vaginalis and in the other layers of the Scrotum.—In many cases, especially where patients have been able to keep the parts supported and unirritated, very little alteration takes place in the tunica vaginalis, this and the scrotal tunics appearing, in spite of frequent tappings, thinned by the distension to which they have been subjected. But in advanced cases, where there has been prolonged irritation, and more especially any injury or effusion of blood, the tunica vaginalis becomes opaque and thick, and the sub-serous connective tissue is also thickened and condensed, being gradually converted into a kind of laminated fascia. The tunica albuginea is also thickened by the chronic inflammation in its neighbourhood. In extreme cases of this hyperplastic thickening the tunica vaginalis may present to the unaided eye the appearance of cartilage, either over an extensive area or as localised projecting masses. Later on, as in other serous membranes—*e.g.*, the pericardium—calcification[†] may take place in this densely sclerosed tissue. In addition to plates or flattened masses of this kind, others of a similar nature but different shape—*e.g.*, warty, pedunculated, or polypoid—may be present.

Very rarely, as in the accompanying figure (14), the sac of the tunica vaginalis is uniformly obliterated over a large part of its extent, leaving a small cavity. Thus, in Fig. 14 it would have been very difficult, if not impossible, to diagnose the actual condition from one of hydrocele of the lower part of the cord.

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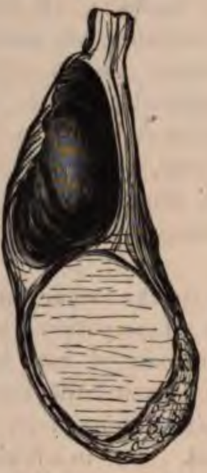
[*] From a table of 1000 cases of hydrocele at Calcutta, constructed by Dr. Dujat (*Gaz. Méd. de Paris*, 1838, p. 562), the quantity of fluid drawn off varied from less than 10 to upwards of 100 ounces.

[†] The specimens 4172 to 4176a Roy. Coll. of Surg. Mus. are examples of this change. In two, the walls of the tunica vaginalis are almost completely calcified; in the others, the change has taken the shape of scales, plates, or irregular, rough deposits. The testicle is only shown in two of the specimens. In one it is markedly atrophied, in the other it is stated to have been normal in structure.

FIG. 14.



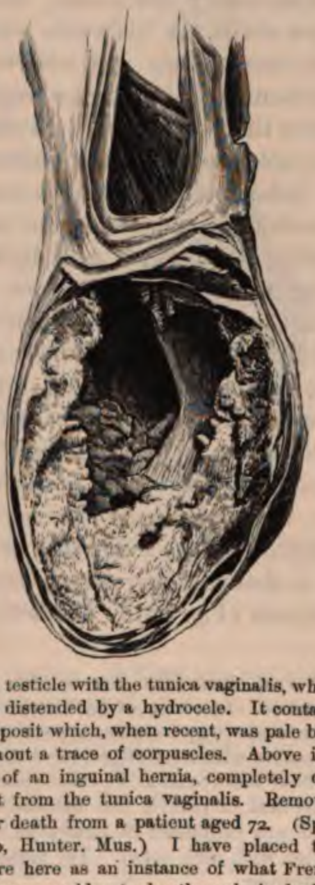
Partial hydrocele of the tunica vaginalis. The surfaces of this sac are everywhere adherent, save above. (Prep. E. E. 64, St. Thomas's Hosp. Mus.) (Osborn.)

Specimens 4162 to 4167 Roy. Coll. of Surg. Mus. show partial hydroceles resulting from incomplete obliteration of the tunica vaginalis. In nearly every case it is the lower part of the sac which is obliterated. This is so in No. 4167, but at the upper part the sac is in some places distended, in others its surfaces are united by adhesions, so that it must have formed a kind of multilocular hydrocele. Prep. 4141, Roy. Coll. of Surg. Mus. bears on this subject of partial hydroceles or collection of fluid in cavities left after the partial obliteration of the sac of the tunica vaginalis. It shows two distinct sacs connected with the testicle, both of which are alike the seats of hydrocele. The larger and posterior sac is not different from that of an ordinary hydrocele of the tunica vaginalis. It would contain about 6 oz. of fluid, and the testicle is at the lower part of its posterior wall. The smaller anterior sac is situated in front of the lower part of the other; it would hold between 3 and 4 oz. of fluid, and in structure it also resembles a distended tunica vaginalis. The partition between it and the posterior sac is complete, and covered with smooth serous membrane on both sides. A hernial sac is situated just above the hydrocele. It bears marks of recent inflammation, the patient, aged seventy, having died soon after an operation for strangulated hernia. The hydrocele had existed twenty-five years. The catalogue goes on to say, in accounting for the two sacs, "it may be supposed either that a layer of false membrane had divided an originally single sac, and had gradually become thicker and firmer, or—which is the more probable—that the anterior cavity is that of a sac which, like an encysted hydrocele of the cord, formed outside the original hydrocele, and became in course of time more closely connected with it." With regard to this latter supposition, I would remark that this anterior and smaller hydrocele is quite away from the neighbourhood of the cord, and that there is partial formation of a secondary cyst in the upper part of the posterior or larger hydrocele.

It is of the utmost importance to remember the possible existence of these alterations, and for two reasons. With regard to radical cure, the altered tunica vaginalis will be very evascular, and but little inclined to respond with mild inflammatory exudation to the ordinary treatment. Thus, if the ordinary iodine injection be used, there is a risk that it will be without result; while if stronger solutions are made use of, it is to be feared that sloughing of the dense evascular tissue will follow, with destruction of the scrotum and other grave sequelæ. An antiseptic incision (p. 150) is thus a safer means of curing these cases radically. Again, the above described thickening of the coverings of the testicle may lead, especially if very little, and that perhaps thickened and syrupy, fluid is present, to grave errors in diagnosis (p. 122).

Allusion must be made to the false membranes, which are occasionally found on the inner surface of the tunica vaginalis. These form no part of an ordinary hydrocele unless inflammation has been present. They result from the plastic exudation of an acuter condition, and testify to inflammation following injury, an attempted radical cure by injection, &c.

Fig. 15.



A testicle with the tunica vaginalis, which was distended by a hydrocele. It contains a deposit which, when recent, was pale buff, without a trace of corpuscles. Above is a sac of an inguinal hernia, completely distinct from the tunica vaginalis. Removed after death from a patient aged 72. (Spec. 4150, Hunter. Mus.) I have placed this figure here as an instance of what French writers consider to be the rule in hydroceles. If this were so, there should be more specimens of this kind in our museums, whereas the condition most commonly met with is that shown in Fig. 17.

The cremaster is often, as in large herniæ, increased in size, this being partly due to a true hypertrophy, from the increased work which the muscle has to perform, and partly to chronic inflammatory thickening of its intermuscular septa.

Cavity of the Tunica Vaginalis.—Usually this is single, and, when much distended, pyriform, owing to the dilatation upwards of the parietal portion along the cord. Occasionally, from the absence of this extension, or from the obliteration by inflammatory thickening, the shape is more circular. An hour-glass shape, the hydrocele "en bissac" of some French writers, is not uncommonly met with. Here the constriction is due to a thickening in the tunica vaginalis, rendering it more unyielding there than elsewhere. In these cases the two cavities usually, but not invariably, communicate. The question whether synechiæ or inflammatory adhesions can produce a bilocular or multilocular condition is one of great importance in treatment. From the facility with which most hydroceles are emptied by a single tapping, the presence of more than one cavity is certainly rare.* Mr. Curling was of opinion that what is called a multilocular hydrocele is usually a form of the encysted, or a complication of the vaginal and encysted. Mr. Curling also draws attention to the fact that one form of sac or pouch which may be met with in hydroceles is not commonly described. It is formed by the distension of the digital pouch or depression of the visceral part of the tunica vaginalis between the testis and epididymis, and is thus situated on the inner side of the testis, though the opening into it is always found on the outer side, between the testis and epididymis (Fig. 16).† Dr. Béraud has described (*Arch. Gén. de Méd.*

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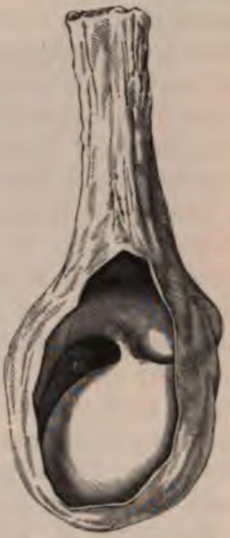
* Prof. Senn (*Ref. Handb. Med. Sci.*, p. 729) gives the following interesting instance. In a case of hydrocele of nearly twenty years' standing, the tumour presented a very irregular appearance, with indurated walls, nowhere translucent. Puncture with a needle revealed the presence of serum, but only a small quantity of fluid was removed by subsequent aspiration. As the patient had suffered a good deal of pain, a free incision was made, which disclosed the fact that the fluid was contained in numerous distinct compartments having no communication with each other. The patient, aged seventy, made a good recovery after castration.

† This may, perhaps, account for the fact that in some of these hydroceles owing to induration at some parts of the wall and thinning at others, the bulging of the fluid which takes place may appear on the inner side and extend so far over on to the opposite half of the scrotum as to simulate a double hydrocele. Prep. 4130 Mus. Roy. Coll. Surg. shows the above recess half partitioned off from the main cavity while the distended sac has gradually formed by the side of the epididymis. Prep. 4134 shows the same kind of pouch somewhat more distinctly marked off, and forming a subsidiary sac which opens into the main cavity by an opening about the size of a swan shot. In Prep. 4133 this recess by the side of the epididymis is nearly effaced by the great enlargement of the sac.

1856, p. 670) another variety of hydrocele "en bissac." In the course of a dissection he found a hydrocele consisting of two cavities, the one scrotal or superficial, the other the vaginal cavity proper. The former, the larger of the two, lay in front of the testicle, and was bounded externally by the dartos; its inner surface, white, smooth and polished, had all the features of a serous membrane. This and the vaginal cavity proper were joined at the upper part by an opening the size of a franc-piece, the borders of the opening being round and smooth. In discussing the cause of this peculiar hydrocele, Dr. Béraud puts aside the idea that it resulted from tapping, and the non-closure of the puncture in the tunica vaginalis and consequent collection of fluid subcutaneously, and also the theory that the two sacs developed independently and simultaneously. Having found, on injection of the tunica vaginalis with tallow at a low pressure, that an exact mould showed numerous processes of the serous tunic, forming glove-like diverticula,[*] Dr. Béraud considered that the bilocular hydrocele may originate in one of these. During the formation of a hydrocele, such a process becomes gradually distended; being less firm and resistant than the tunica vaginalis itself, it gradually forms a large pouch, surpassing in size the sac of the tunica vaginalis, and ultimately lodging itself in the cellular tissue of the scrotum.[†] Such hydroceles, Dr. Béraud thought, may be known by their extreme translucency, and by their more rapid

FIG. 16.



Aperture of the pouch between the testis and the body of the epididymis. (Hunt. Mus. No. 4130.) (Curling).

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[*] Mr. Pearce Gould (*Lancet*, 1890, p. 894) records a case of vaginal hydrocele with a hernial protrusion of the sac. This had all the usual character of a vaginal hydrocele with one uncommon addition. Rather above the centre of the swelling in front was a prominent bulge, about the size of a marble. Fluid from this could be easily pushed back into the general cavity.

[†] There is a specimen (E. E. 55) in St. Thomas's Hospital Museum which suggests a possibly early stage of the above. It shows a hydrocele of the tunica vaginalis with several small sacculi projecting from its cavity and communicating with it by apertures of various size.

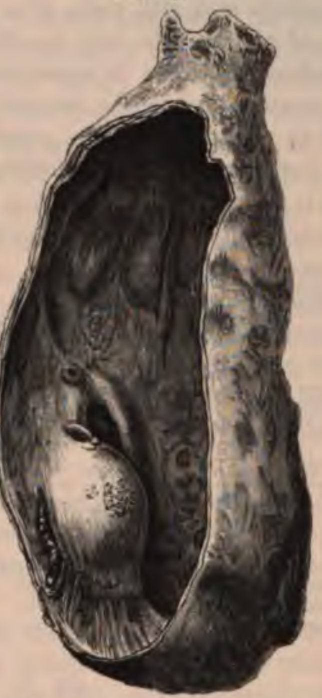
development, the fluid meeting with less resistance from the skin and dartos than from the tunica vaginalis. A case which appears to be similar to the above has been more recently described by Dr. O. Will (*Edin. Med. Journ.*, 1881, vol. ii. p. 15). An old man had a large hydrocele on the right side. On this were two elevations, and over the larger of these the scrotal raphê passed. Translucency was evident throughout, but the walls of the smaller lobules were much thinner than those of the swelling on which they rested. On examining the anterior surface of the swelling, an opening could be felt in the tunica vaginalis, large enough to admit the tip of the fore-finger. Through this opening there was a communication between the larger and smaller swellings, for the latter could be emptied by squeezing.

Condition of the Testis and Epididymis in Hydrocele.—This will depend on the duration of the disease, the length of time during which the fluid has been allowed to collect or re-collect, and, much more than these, on the amount and severity of any inflammatory attacks. If the hydrocele has been free from irritation, the mere pressure of the fluid will not have affected much, if at all, the soundness of the gland. It may be altered in shape, and flattened by the pressure of the fluid, but if no inflammatory attacks have been set up, the glandular tissue is not seriously affected. But if repeated inflammation has led to recurrent thickening and contraction of the tunica vaginalis and tunica albuginea, and the connective tissue in relation with them, an interstitial inflammation of the testis itself will be set up, leading ultimately to atrophy.

With regard to the epididymis, allusion has already been made (p. 103) to the view of M. Panas, that this was usually indurated, and thus the cause of the hydrocele. Further experience has, however, shown that this induration, which can often be made out after the evacuation of the hydrocele, is a chronic inflammatory thickening, not of the epididymis itself, but of its fibrous covering.

Attention has been drawn by some French writers to a more important bearing of large hydroceles upon the epididymis. As the tunica vaginalis is more and more distended with fluid its cavity must increase, not only by the stretching of its walls, but by the opening up of its cul-de-sacs. Of these the chief is the one lying between the epididymis and testis. As this is distended with fluid the epididymis is gradually lifted away from the testis, as well as elongated and flattened (Fig. 17). The gradual effect of this upon the vasa efferentia, as they leave the testis, is to gradually thin and stretch them. This interference with their function would be a more serious matter if large hydroceles did not usually occur in patients of middle or later life.

FIG. 17.



A testicle with its tunica vaginalis, showing the distension and enlargement of the latter, constituting a simple hydrocele. The testicle is situated near the junction of the middle and lower thirds of the posterior wall of the sac. There are two small pedunculated bodies on the upper part of the epididymis. The specimen also shows the lifting away of the epididymis from the testicle, and the stretching and flattening of the former, which has been brought about by the gradually increasing pressure of the fluid, thus opening out the cul-de-sac between the testis and the epididymis. A few patches of inflammatory thickening are seen upon the visceral and parietal layer of the tunica vaginalis. This figure (which, in its absence of any marked pachy-vaginalitis and false membranes, is a good instance of our hospital specimens of hydrocele) should be compared with Fig. 15. (Spec. 4130, Hunt. Mus.)

It will be seen that the only two important alterations in the testis which are brought about by a hydrocele—viz., thickening of its coats and a gradually progressing sclerosis of the gland itself, and great stretching of the epididymis and the vasa efferentia, are only likely to occur in long-standing and untreated hydroceles. The practical outcome of this is that a patient who does not submit his hydrocele to radical cure, should keep it carefully guarded from all irritation, and have it tapped at regular intervals.

The Position of the Testicle in Vaginal Hydrocele.—Before concluding the examination of a hydrocele this point should always, if possible, be cleared up, owing to its important bearing upon the site of tapping. Usually, of course, the testis lies below and behind, but it may occupy the front part of the swelling when it is inverted (p. 94), or when it has been drawn to the front by adhesions forming between it and the parietal tunica vaginalis. That this is a *bonâ fide* risk is shown by the cases quoted below

(Footnote, p. 117), in one of which the trocar in the hands of Dupuytren himself transfixed the testicle. It is not only the failure of the operation and the pain inflicted, but the possibility of orchitis and, still more, of a hæmatocele following. The position of the testicle may usually be made out by the absence of translucency where its mass intercepts the luminous rays. Where no translucency can be detected, the presence of the testicle may still be made out in some cases by firm pressure here and there, till testicular sensation, modified but not lost, is reached. But this is never entirely free from fallacies, and in obscure cases the position of the testis can only be cleared up by an antiseptic incision very carefully made.

Side Affected.—The relative frequency with which the right or left tunica vaginalis is affected has been variously stated. But when a really large number of cases are collected for examination, it will appear that hydrocele affects the right and left side about equally. The following table is given by Prof. Kocher (*loc. supra cit.*, p. 91):

——	Left.	Right.	Double.
Bryant (117) and Curling (115) = 232 cases	106	106	20
Socin . . . . 15 = ,,	8	5	2
Baum . . . . 99 = ,,	48	45	6
Langenbeck . . 69 = ,,	28	31	10
415 = ,,	190	187	38

It should be stated that in a still larger number of cases (1000), collected by M. Dujat (*Gaz. Méd.*, 1838), the left side showed a preponderance. The numbers here are, left, 324; right, 305; 371 being double.

Symptoms.—Easy as the diagnosis is in ordinary cases there is no symptom or sign which is absolutely decisive. In the examination of an ordinary hydrocele one side of the scrotum is found to be enlarged, the swelling reaching up towards and seeming to encroach upon the external abdominal ring, and thus somewhat pyriform in shape. It is distinctly limited above, in the root of the scrotum, and when the patient coughs gives no impulse. When the swelling is pressed downwards, and the scrotal tunics are thus stretched over it, its outline is smooth and uniform; it gives a distinct thrill when lightly percussed, and fluctuates on palpation. Finally, it is translucent. In examination of the above in detail, the last point will be taken first, as being the principal, or the essential diagnostic, sign. It is obtained as follows:—The room being darkened, the surgeon grasps the neck of the tumour firmly but gently, so as to press its contents downwards, and thus forcibly distend and put on the stretch the lower part of the tumour. Supposing it to be a right-sided hydrocele, this is done with the left hand; the ulnar border of the right hand is then placed on the convexity of the tumour, while an assistant, or the patient, brings the flame of a candle or match close to the opposite side of the scrotum and holds it there steadily. A reddish glare is now seen all over the swelling, save behind and below, where a dark shadow usually betokens the presence of the testicle. Valuable as this sign is when properly used, one or two fallacies must be remembered. If present it proves the case, unless it be one of hydatid, or hernia in an infant (*vide infra*), but the converse is not true. Translucency is difficult or impossible of detection when the sac is much thickened, where the fluid is turbid, flocculent, scanty and syrupy, or mixed with blood of varying date. But these are not ordinary hydroceles. In difficult cases additional precautions should be taken to use a really good light—*e.g.*, an electric light—to thoroughly darken the surroundings, and to ensure that the parts are made completely and uniformly tense.* When these precautions are really taken many a dark hydrocele clears up. The old-fashioned stethoscope should also be used in difficult cases. Care must be taken to keep the instrument and the light opposite to each other, and to hold the stethoscope so applied against the swelling that no other rays of light can enter the tube.

Other very rare cases of hydrocele in which it may be difficult to obtain translucency are cases in which the testis is inverted,† where the tunica vaginalis is adherent to the testicle—*e.g.*, in front—or where the swelling is multilocular, and the cavities are too small or their walls too thick to allow light to pass through.

On the other hand, if it be asked whether translucency is ever met with in any scrotal swellings save hydroceles, the answer must be in the affirmative, though the cases are extremely rare.

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* French writers have a very happy way of expressing the way in which this should be done. Thus they speak of making the swelling project, as if one was about to shell out the testicle.

† M. Dupuytren (*Leç. Oral.*, t. iv. p. 190) mentions two cases of hydrocele in which the testicle being in front of the sac instead of behind was punctured by the trocar. In the second case, Dupuytren himself was the operator.

In herniæ in infants, where the sac contains bowel only, and this is empty of fæces, translucency may be obtained. My attention was first drawn to this fact by a case of Mr. Beck's (*Brit. Med. Journ.*, Dec. 9, 1882), in which a strangulated inguinal hernia in an infant of ten weeks was "quite translucent." I have since verified this fact in three like cases, in which I had the opportunity of making an examination while the little patient was under an anæsthetic. The other conditions present are, of course, quite sufficient to prevent any error.

As bearing on the above subject, the following case, which was under the care of Prof. Humphry, is of interest:

Transparent Swelling in and near the Inguinal Canal proving to be an Abscess.—A young woman had a fluctuating swelling as large as a turkey's egg over the region of the right external inguinal ring, extending towards the pubes in the one direction and along the course of the inguinal canal in the other. It was seen to be transparent when examined with a candle, and was thought possible to be a cyst or collection of fluid in the canal of Nuck. It had commenced two years previously, was gradually increasing, and was a source of much inconvenience. A careful incision was made into it, giving vent to a quantity of serum, followed by thin pus and masses of soft white lymph. It was evident that the pus-corpuscles and the lymph had subsided to the bottom of the abscess as the patient lay in bed, and had left the exposed part full of serum only, and therefore transparent. A free vent was given to the pus; gradually the discharge ceased, and the wound healed.

P. Pott seems to me to have undervalued translucency as a test when he wrote: "The transparency of the tumour is the most fallible and uncertain sign belonging to it, and whoever would be acquainted with this disorder must learn to distinguish it by others, and these more certain marks, or he will be liable to fall into very disgraceful as well as pernicious blunders."

Another but rare point to be remembered with regard to translucency is that in some cases, usually large hydroceles with thin walls, and with a small testicle, the translucency appears to be complete, there being no opacity whatever to reveal the presence of the testicle. MM. Monod and Terrillon give a useful warning on this point—*i.e.*, that before a hydrocele is declared to be totally translucent it should be examined not only, as usual, from side to side, but also from before backwards.

Next to translucency, fluctuation and the thrill given by percussion, as giving evidence of fluid, are the most valuable. The sense of fluid which is given to the fingers of one hand dipped suddenly upon one surface of the swelling, while it is supported by the other hand, is difficult to obtain when the sac is extremely distended, or when its walls are very thick and its contents of syrupy consistence.

The other characters are also noteworthy, as in doubtful cases it is only by weighing all that a correct conclusion can be arrived at.

The shape is usually ovoid, with the long axis vertical, or more distinctly pyriform when the fluid has extended upwards amongst the constituents of the cord, or when the tunica vaginalis is continuous for a short distance with a remnant of the processus funicularis. Occasionally, the long axis of the swelling is horizontal. It is limited to the scrotum, though when the above upward extension is present, it may appear to involve the groin and inguinal region. The swelling is smooth and uniform, without any of the elevations which may be present in orchitis, or the points of varying consistency and resistance which new growths or hæmatoceles may present. The cord is free and normal, the swelling cannot be returned into the abdomen, it receives no impulse when the patient coughs, and is dull on percussion. The progress of the hydrocele is slow and painless, the direct inconvenience being due to its bulk and weight; the former impeding free movement and exposing the part to injury, and also causing annoyance from the unsightly swelling which becomes apparent through the patient's dress. The weight produces an increasing pull upon the cord, and thus proving a source of discomfort which is referred to the inguinal and lumbar regions. When the swelling is large, the skin of the penis is so dragged forward that its body is buried, and its aperture is only represented by an opening like a buttonhole, or one recalling the umbilicus.* This drag on the penis, and consequent interference with micturition, &c., is another trouble which often causes patients to have resort to tapping. Pain is very rare, being usually only met with in cases of rapid re-collection of the fluid after tapping, in which cases the possibility of some admixture of blood, or of the rarer complication of a loose body in the tunica vaginalis (p. 214), must be borne in mind.

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* Sometimes the dribbling of the urine upon the scrotum, owing to the distorted condition of the prepuce, is a great annoyance.

Other points which are sometimes given are of little value. These are: the way in which the swelling began, and its weight. The first will only have been noticed by a patient intelligent as well as observant. The weight of a hydrocele would at first appear to be a valuable point in diagnosis between a hydrocele and a hæmatocele, or a malignant growth of the testis. But when it is remembered how difficult it is to accurately compare the weight of a swelling which one has in one's hand and that of one which one only carries in one's mind, and, again, how small is the difference between the actual density of a solid tumour and a hydrocele, it will be seen that any evidence drawn from the weight of the swellings of the testis is of but little value.*

Diagnosis of Hydrocele of the Tunica Vaginalis.—This will be, sometimes, a matter of much difficulty—*e.g.*, in old hydroceles with thickened, altered walls, and condensed contents, where the transparency and fluctuation, and, perhaps, the smooth uniform surface are wanting.

The affections which are **most liable to be confused with hydrocele** are **scrotal herniæ, some other hydroceles, hæmatoceles,** and some **new growths** of the testicle.

The distinction of a hydrocele from a scrotal hernia will generally be easy if attention is paid to the following points. The hernia usually gives an impulse on coughing; is either resonant in part, on percussion, or, if dull, gives the lobulated or irregular feel of omentum; it can usually be returned with the sudden slip or gurgling which are characteristic, and often varies with the position of the patient, accordingly as he is erect or lying down. A hydrocele, on the other hand, gives, usually, no impulse on coughing, is irreducible, fluctuating, uniform, and translucent. In hydrocele the cord can be distinctly felt above the tumour, but in hernia its presence is much less distinctly felt.

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* The late M. Nélaton used to cast great doubt upon the value of weight in the diagnosis of tumours of the testicle (*Arch. Gén. de Méd.*, t. ii. p. 738). In the American edition of his *Clinical Lectures on Surgery*, p. 633 *et seq.*, are the following remarks: "Great weight of the tumour is found in authors as one of the symptoms of cancerous affection of the testicle, but long ago, he, M. Nélaton, had his doubts about it, and the following is the result of his examinations: A large glass full of water was in readiness, and a testicle after its removal was put into it, the displaced water being received in a basin in which the glass stood. The displaced water, of course equal in volume to the testicle, was then weighed, and after it the testicle itself. This was done on many different occasions, and it showed that if the cancerous mass weighs 250 grammes, the water will weigh 245. Now it is most certainly impossible for any hand to detect so small a difference as this; and, moreover, it must be recollected that the contents of a hydrocele are serum, which is heavier than water; again, there is the testicle, and in addition to the rest are envelopes of the part, the same in both cases, and tending to equalise still more the specific gravity." In another case the tumour weighed 144 grammes, and the water which it displaced 135. The following are the concluding words of the first named article:—"On peut donc dire que le signe tiré du poids spécifique des tumeurs du testicule est un signe qui ne sauvait avoir aucune valeur. C'est là, dit M. Nélaton, un de ces signes qui ont été inventés dans le cabinet, et qui ne sont transmis jusqu'à nous que parce que personne n'a songé à en vérifier l'exactitude."

In hydrocele, as already stated (p. 115), the testis often requires care to find it, especially when it projects into the cavity of a large hydrocele; in hernia, on the other hand, it is more easily to be made out in the fundus scroti distinct from the hernia, save when this is congenital. Finally, the hydrocele begins at the bottom of the scrotum, rarely reaches as high as the external abdominal ring; whereas the hernia begins above and gradually descends.

Difficulty may be met with in the following conditions when hernia and hydrocele co-exist. Here, if (α) the hernia be reducible, the characters already given will distinguish the hydrocele. (β) If the hernia is irreducible, careful questioning will elicit the fact that this was not always so, while the lack of uniformity, fluctuation, thrill and translucency, together with the fact that the hernia will very likely be of unequal consistency, and present the feel of omentum, and is certain to extend up into the inguinal canal, will all point strongly to hernia. The diagnosis may be especially difficult in the following cases: (γ) When a hydrocele swells suddenly from an injury, especially if very tense, painful and discoloured. If no history of a previously existing hydrocele is given, the case may be most misleading, especially if no action of the bowels has taken place since the injury. The absence of any increasing pain and swelling in the abdomen, the presence of local symptoms rather than those of strangulation, and careful watching for a few days, will help in the diagnosis. (δ) When the hydrocele extends up along the cord to the ring, or into the inguinal canal as high as the internal ring, and thus receives a distinct impulse on coughing. (ϵ) If, in addition to this symptom, the sac is thick or its contents of a dark colour, and translucency thus absent, the surgeon will only have the history to go by, and the patient will often not have noticed whether the swelling began above or below.

In all cases of doubt, the case should be cleared up by a careful antiseptic incision.

From **other Hydroceles.**—The diagnosis of encysted from vaginal hydrocele is given at p. 205. How difficult this may be occasionally is shown by a specimen (E. E. 71) in St. Thomas's Hospital Museum. It is described as a simple serous hydrocele of the cord. It measured 3 inches by 4 longitudinally, and was attached to the cord ¾ inch above the testicle. It was also loosely adherent to the anterior part of the tunica vaginalis, and, descended 2 inches below the testicle, which protruded slightly into its cavity. From its situation it was first taken for a hydrocele of the tunica vaginalis. The character of the fluid, and the fact that the testicle protruded into it much less than usual, led to a right diagnosis.

A hæmatocele can usually be distinguished from a hydrocele by the absence of translucency, the greater solidity, the obscureness of the fluctuation, the suddeness of the onset, and, usually, the history of an accident or a tapping. In cases of doubt, an incision made carefully with strict antiseptic precautions should be resorted to. Such a step is to be preferred to puncture with a trocar, because more information is gained by it, and because, if the swelling turn out to be a hydrocele with thickened sac, a free incision, followed by granulation, is, on the whole, the best treatment. The following case, which was under Prof. Humphry's care, is an instance of the difficulties occasionally met with in the diagnosis of hydrocele: A man, aged forty-five, had a swelling of the left testicle as large as a cocoanut, heavy as if it were solid, and with indistinct feeling of fluctuation; not the slightest transparency; a slight constriction near the middle; large tortuous veins upon its forepart; the cord was healthy. There was a history of a blow, after which the part became swollen and painful. The case was supposed to be a hæmatocele. Yet puncture with a trocar gave vent to 12 oz. of the ordinary straw-coloured fluid of hydrocele, the sac being much thickened.

The **diagnosis between hydrocele and malignant disease** of the testis will occasionally be obscure when, in a long-standing hydrocele, hardness and uneven surface, want of transparency, and obscureness of fluctuation owing to the cartilaginous nature of the wall and thickened contents, simulate the characters of the firmer and more fibrous varieties of malignant disease of the testis. The following cases* illustrate the above difficulty:

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* Curling, *loc. supra cit.*, p. 108; Dupuytren, *Leç. Oral. de Clin. Chir.*, t. iv. p. 209.

A swelling of small size in the scrotum of an old man was so irregular and uneven, felt so solid, and weighed so heavy, that it was impossible to determine exactly whether the swelling was occasioned by a morbid enlargement of the gland, a hæmatocele, or a hydrocele with the sac unusually thickened. Owing to the age of the patient, any operation was out of the question. After his death the swelling was found to be a hydrocele, the sac of which was lined by an extremely dense false membrane, and contained a soft oleaginous substance, chiefly cholesterin. In such a case the long duration and the small size of the swelling, the absence of any increase, together with the fact that there was no evidence of local or general infection, would be against any new growth.

A man, of about forty, whose right testicle had been violently bruised, suffered persistently from acute pain in it for several years, the size of the organ steadily increasing all the time. The testis was hard, weighty, uneven, and, in addition to the fact that it was always acutely sensitive, it was also from time to time the seat of lancinating pains, such as are usually looked upon as almost characteristic of malignant degeneration. M. Dupuytren looked upon it as such, and recommended extirpation, which was performed shortly after. The testis being exposed by incision, the operator, having detected a fluctuating spot, in order to make sure of the diagnosis, plunged in the point of his bistoury. As there immediately followed a jet of liquid, reddish in colour and odourless, apparently analogous to that which is found in the cysts of degenerating new growths, the testis was extirpated. On subsequent examination of the parts, it was found that the swelling was entirely formed of a tunica vaginalis, which had become cartilaginous and of unequal thickness. The cavity which had been entered by puncture was nothing more than the proper sac of the tunica vaginalis, and the escaping liquid owed its qualities and colour to admixture with a certain quantity of blood. The glandular substance of the testicle was sound and healthy.

Complications of Hydrocele.—A hydrocele may be complicated (α) by the co-existence of one or more hydroceles, or (β) by the presence of a hernia.

Multiple Hydroceles.[*]—The combination of hydroceles most frequently met with is that of ordinary hydrocele of the tunica vaginalis and encysted hydrocele of the testis. The encysted hydrocele is probably formed first, and, owing to the irritation which its presence produces, effusion of fluid takes place secondarily into the cavity of the tunica vaginalis. Attempts at radical cure of the latter may thus be rendered futile. When the latter collection of fluid has attained a large size, an encysted hydrocele may easily be overlooked. In such cases, when the tunica vaginalis is tapped the usual yellow fluid escapes, but the swelling, though diminished, is not entirely removed. If now the trocar be thrust into the remaining swelling, the characteristic watery or opalescent fluid of encysted hydroceles comes away.

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[*] Other instances of multiple hydroceles have been given above, p. 110.

As noticed by M. Dupuytren (*Leç. Oral. de Clin. Chir.*, t. iv p. 197), this combination of hydroceles has sometimes been mistaken for a multilocular hydrocele. If a radical cure is desired, the swelling should be incised with antiseptic precautions. Iodine injection of the encysted or primary hydrocele will very likely cure this, but as will be mentioned, it is not uncommon to find not one but two or three small cysts in the neighbourhood of the epididymis. These will be most thoroughly exposed and dealt with by incision.

Another, though less common, combination* of hydrocele is that of encysted hydrocele of the cord with hydrocele of the tunica vaginalis. In this case the swellings are more distinct and usually separated by a furrow of varying width, according to the extent to which the funicular process of peritonæum has been obliterated below the hydrocele of the cord. In treating this combination, acupuncture will usually suffice in childhood Later on in life antiseptic incision, followed by removal of the sac, is to be preferred to injection with iodine or the use of a seton This is especially the case where the encysted hydrocele of the cord is within the inguinal canal.

Mr. Curling has recorded (*loc. supra cit.*, p. 202) the following case, which occurred in a child, aged six. A large hydrocele on the right side extended nearly up to the external ring. Three acupunctures were made, and in ten days all the fluid had disappeared, but an encysted hydrocele of the cord was now found just above the testicle, this having been previously concealed by the fluid in the vaginal sac. This was first treated by painting with iodine, and, later, punctured with a needle. This was repeated two or three times, and in a fortnight the encysted hydrocele had disappeared.

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* This complication may probably be explained as follows. The hydrocele o the tunica vaginalis was probably infantile originally, and that of the cord du also to further imperfect obliteration of the processus funiculo-vaginalis.

In May 1889, I operated on the following combination of hydroceles in a patient of Dr. Brewer's at Dalston. In a patient, aged twenty-three, an irregular somewhat lobulated swelling occupied the right half of the scrotum. It extended along the cord, but was well defined just below the external abdominal ring. It was irreducible, without impulse on coughing, and gave evidence both of thrill and fluctuation. But a puzzling point arose from the fact that the fluid could not be displaced from one part of the swelling to the other. The testis, which was healthy, lay somewhat to the inner side, but was surrounded by the swelling. From the shape, slow formation and position of the testis, I was inclined to regard it as an encysted hydrocele, or spermatocele. Antiseptic exploration proved the existence of the following: (1) A hydrocele of the tunica vaginalis reaching upwards along an unobliterated processus funicularis; (2) A small encysted hydrocele with fluid, containing spermatozoa; (3) A bunch of cysts reaching from the site of the hydatid of Morgagni upwards along the cord. Some of these were the size of a small round pea, two of them as large as a hazel-nut. These were snipped away, and the hydroceles treated by partial excision and stitching (p. 54). No suppuration followed, but as the healing was very tedious, and as the patient had the prospect of being called upon to take an appointment in one of the Colonies at short notice, I performed castration at his request. A good recovery followed.

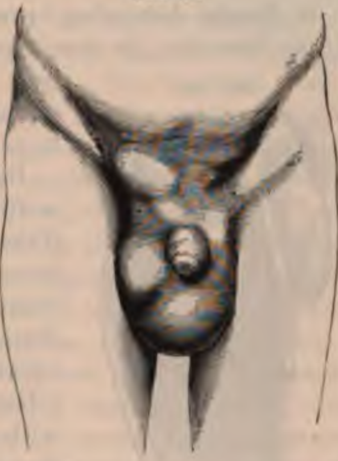
The following case illustrates well the difficulties which may be met with in the diagnosis of some of these cases, and also how they are to be met. It was under the care of Prof. Humphry. It appears to be akin to Dr. Steinthal's cases of "multilocular hydrocele," which are given below.

A youth, aged nineteen, had a swelling on the right side of the scrotum, closely connected with the upper and fore part of the testicle. Fluctuation could be perceived in it, and transparency when the skin was tightly stretched over it. Above this, at the external ring, was a small, soft swelling, doughy, not distinctly fluctuating. Like a hernia, it went up into the abdomen when he was laid down, and returned again when he stood up and coughed. It also communicated an impulse when he coughed. He wore a truss, which had been ordered by an experienced hospital surgeon. Prof. Humphry was induced to examine more carefully by observing that the impulse was less distinct than is usual with hernia. Moreover, when the patient stood and coughed, the swelling seemed to bolt past the finger and thumb, which, with a little pressure, met above it, and it appeared as if it could be pressed to and fro, as if it were a distinct cyst or tumour, and not a swelling prolonged into the abdomen. When the swelling had disappeared on the patient's lying down, it could be brought into view, and even brought beyond the external ring, by traction on the cord. When thus pulled down, and the skin drawn tightly over it, it proved translucent. Prof. Humphry accordingly cut down carefully through the cremaster, which was unusually distinct, and the other coverings, and exposed a sac, in which membranous contents, capable of being moved about and having vessels on them, could be seen. They looked and felt like omentum or intestine in a hernial sac. It being again found that the swelling was quite translucent, and that its contents could not be returned into the abdomen while the cord was fixed, the sac was opened, giving vent to some clear fluid and exposing several thin-walled cysts, bearing vessels and containing similar fluid. Some were as large as a bean, others smaller. They were connected together, and with the upper part of the cyst, which proved to be a closed cavity, unconnected with the abdomen. The mass of cysts, with a portion of the containing sac, was cut away, and the lower and larger swelling, which appeared to be formed by a portion of the tunica vaginalis distended with fluid, was then opened. Suppuration ensued, the wound healed up, and the lad recovered.

Under the heading of multilocular hydrocele, Dr. Steinthal (*Centr. f. Chir.*, Oct. 10, 1885) describes two instances of a very rare form of hydrocele. In the age of the patients, and in the mass of cysts found, the cases resemble that of Prof. Humphry, just given. The first was that of a man, aged twenty-two, who, when fourteen years old, received an injury to his scrotum. A hydrocele followed, which was tapped several times. It was finally treated by incision of the sac. When the main sac was opened, a mass, composed of a multitude of cysts, was seen at the bottom of it. The largest of these was of the size of a cherry-stone. They contained a clear, watery fluid. The mass was removed. A permanent cure followed.

In the second case the patient was aged twenty. On the hydrocele being incised the local condition was in all essential points identical with that just described. The minute cysts, on microscopical examination, were found to be lined with a fine epithelium, and were embedded in vascular tissue rich in cells. Another space contained a lymph-thrombus. From these appearances Dr. Steinthal concluded that the cysts had developed, owing to some inflammatory process, in dilated lymph vessels, and he accordingly gave to the condition the name of cystoid lymphangeioma.

FIG. 18.

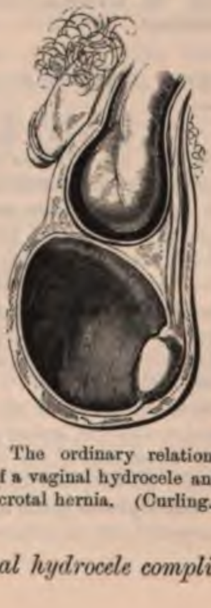


Hydrocele on the left side and a scrotal hernia on the right. (Osborn.)

(β) **Combination of Hydrocele and Hernia.**—The co-existence of hydrocele of the tunica vaginalis with an inguinal or scrotal hernia is by no means uncommon. A large hydrocele predisposes to hernia, partly by its constant drag upon the cord and peritonæum above, and also by its tendency to reach upwards, and thus to weaken the external abdominal ring.

There is usually some amount of free space, or of constriction between the two swellings, especially at first. Where, however, they have lasted some time, the diagnosis is rendered more difficult, owing to alterations which are taking place in them—viz., thickening of the tunica vaginalis and of the hernial sac, adhesions between the hernial contents and their investing sac, atrophy of the testis and spreading out of the constituents of the cord. Furthermore, as time goes on, adhesions take place between the hernial sac and the hydrocele, which not only renders the diagnosis more difficult, but also, especially in those advanced in life, complicates the treatment. The hydrocele is usually placed anterior to the hernia, which lies at the back of the scrotum. If, on careful examination, the hydrocele be posterior to the hernial sac, the former will usually be found to have opened up a part of the processus funicularis.

FIG. 19.



The ordinary relations of a vaginal hydrocele and scrotal hernia. (Curling.)

Thus, the *three* following *varieties of vaginal hydrocele compli-*

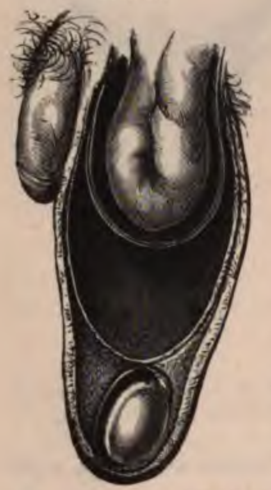
cated with hernia may be met with, the first common, the other two very rare :

i. The hernia remains above the hydrocele, either independent of, or more or less intimately blended with it.

ii. Rarely, descending lower it passes behind the hydrocele.

iii. Rare also, the hernia projects into the cavity of the hydrocele, either invaginating itself into the serous membrane which it inverts before it, or by rupturing through it.

FIG. 20.



A hernial sac containing ileum which dipped into an encysted hydrocele of the cord. Mr. Rivington's case.* (Curling.)

Rare though this last condition is, it is worthy of attention from its importance if the hernia present becomes strangulated. It was called by Sir A. Cooper " Encysted hernia of the tunica vaginalis." M. Bourguet, of Aix, who has published an interesting paper on it, proposes to call it " Hernia with a double sac," or " Hernia with an intra-vaginal sac." Its formation is probably something of this kind. Forming as an ordinary hernia, and descending through the external ring, it meets in its descent the distended tunica vaginalis; pushing gradually before it the serous wall, it ends by projecting into the cavity of the hydrocele. Thus the sac (formed as usual by a prolongation of the peritonæum) and its contents have the tunica vaginalis as a second covering. The name of hernia with a double sac, or an intra-vaginal sac, is thus the one which corresponds with the facts of the case. Sometimes the two serous coverings, the peritonæum and the tunica vaginalis, give way where they are in contact; the intestine is then bare, as in Dupuytren's case, in the cavity of the tunica vaginalis. In other cases the tunica vaginalis alone gives way, and the intestine is still covered by its peritonæal layer. The intestine may be strangled either at the ring above, or at the opening resulting from the rupture of the tunica vaginalis. Unless prepared for these conditions, the surgeon may easily make grave mistakes. In operating for hernia under the above conditions he will incise a cavity full of liquid, with a projection at its upper part more or less elongated, and apparently continuous with the abdomen. Imagining that he has opened the sac of a hernia, he will be liable to take this projection for the intestine. The chief aids will be for the surgeon to be on his guard, and to notice that neither finger nor instrument can be insinuated into the upper part of the cavity, and that, moreover, the testis lies exposed at the lower part. Attempts to draw down the supposed intestine will fail, and will help to show that the surgeon has not entered a true hernial sac.

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* This specimen is described by Mr. Rivington in the *London Hospital Reports*, vol. ii. p. 371. It was removed from a subject in the dissecting-room. There was an elongated swelling in the right groin and scrotum. It consisted of a hernial sac containing ileum, which dipped into an encysted hydrocele of the cord, so that if an operation for hernia had been necessary the surgeon would have been embarrassed by opening a cyst containing fluid before reaching the hernial sac. The case differs from those alluded to above, and described by Sir A. Cooper, in the circumstance that the hernial sac projected into an encysted hydrocele of the cord instead of into a vaginal hydrocele. A similar case, with an almost precisely similar diagram, will be found recorded by Mr. Spanton (*Brit. Med. Journ.* 1882, vol. ii. p. 126). The patient was a boy, aged thirteen. The left side of the scrotum was the size of a large hen's egg, somewhat constricted about the centre, and the lowest part clearly contained fluid. The testis was felt quite at the lowest part of the scrotum, and distinct from the tumour above. There was clearly an encysted hydrocele of the cord, with infantile hernia, the sac of the tunica vaginalis being apparently unimplicated. The boy was operated on, and recovered, but no account is given of the parts found at the operation.

Diagnosis.—When hydrocele and hernia co-exist, the two swellings can usually be distinguished if attention is paid to their chief determining points. Thus, the swelling which corresponds to the hydrocele will be dull on percussion, irreducible, without impulse, smooth and uniform in outline, and, if not very tense, giving some evidence of fluctuation. The existence of a thrill should also be examined for. It will also usually give translucency. The upper one, on the other hand, will, unless entirely omental, be resonant in part, non-translucent, giving an impulse, probably reducible to a certain amount, and with characteristic slip or gurgle; while fluctuation is entirely absent, being replaced, when omentum is present, by the doughy, irregular, granular feel. There will also be a history that, at first especially, there was some amount of free space between the swellings.

Encysted hydrocele of the cord is occasionally complicated with inguinal hernia. As explained later this form usually depends upon imperfect obliteration of the processus funicularis. As this obliteration may take place at one or two spots, leaving one or more segments of the serous process unobliterated, the fact that the uppermost of these may communicate with the peritonæal cavity must always be borne in mind when encysted hydrocele of the cord is submitted to a radical cure.

Treatment.—Where in a combined hydrocele and hernia the two swellings are distinct, and the patient not advanced in years, the hydrocele may be treated by injection if this method be preferred, the hernia being first carefully reduced and an adequate truss applied. Where this preliminary step is impracticable, where the hydrocele and hernia seem to be adherent to each other, and where any special reason exists for dreading diffuse inflammation, radical cure by antiseptic incision and partial excision of the sac (p. 150) is to be preferred to other means. In elderly patients with voluminous herniæ, palliative treatment will be the wisest course. Tapping the hydrocele will usually allow of the proper adjustment of a truss.

In children, inguinal herniæ and infantile hydroceles occasionally co-exist. If the persevering use of an adequate truss has failed, the hydroceles should be submitted to radical cure at the same time as the hernia.

Course and Results of a Vaginal Hydrocele, and the Accidents to which it is Liable.—The course of an ordinary hydrocele is in a great majority of cases slow and gradual. Occasionally a history of rapid increase is given after stationary periods, but any rapid increase in size must always raise the suspicion of hæmatocele.*

If a patient who has sought advice for his hydrocele demur as to the treatment, and ask what the consequences may be, the surgeon should let him clearly understand that the process is practically certain to be one of steady increase, and that some of the consequences of an untreated hydrocele are serious. In addition to the tiresome weight, the tendency of the swelling to show through the dress, and to interfere with the functions of the penis, are the risks of the supervention of a hernia, with the difficulty then certain to be experienced of fitting the needful truss, the increasing chance of injury bringing about a hæmatocele, suppuration, or even, in an elderly and weakly patient, fatal sloughing. Some of these points are of sufficient importance to be treated in detail.

(1) **Spontaneous Cure.**—This is extremely rare. In a very

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* M. Réclus (*Dict. Encycl. des Sci. Méd.*, t. xiv. p. 367) relates briefly an interesting case in which an old man previously free from hydrocele was hurt in the pubic region by a horse-hoof, and experienced acute pain in the right testicle; twelve hours afterwards, when examined, the scrotum was free from bruises and distended by a transparent tumour the size of a pigeon's egg. Two hundred grammes of the ordinary citrine-coloured liquid having been drawn off, it was found that the testicle was normal.

few cases it has followed on some inflammation of the part set up by a blow, or after epididymitis, or orchitis, or erysipelas reaching the scrotum from the abdomen or thigh, these cases being assimilated to those of acute hydrocele.*

Sir A. Cooper (*Testis*, p. 177) mentions a case which was cured in a different way—*i.e.*, by spontaneous sloughing of the scrotum, owing to excessive distension of its coats.

(2) **Rupture.**—In another small group of cases, a hydrocele may be cured by the rupture of the distended tunica vaginalis by accidental violence. In these cases the hydrocele has usually attained a large size. The fluid escaping into the adjacent cellular tissue produces œdema with ecchymosis of the scrotum, penis, and inner part of the groin. The fluid not being an irritating one is quickly absorbed, and all the ecchymosis disappears if the scrotum is well raised, and the patient is kept in bed. The cure is not always permanent, this depending chiefly on the amount of inflammation which has been set up. In the following case, recorded by Dr. N. S. Foster (*Lancet*, 1879, vol. ii. p. 871), the rupture is described as having been spontaneous: A powerful man, in robust health, aged fifty-eight, had suffered from a hydrocele of the left tunica vaginalis for seven years. Tapping had been resorted to over a dozen times. Five months after the last tapping the hydrocele had attained the size of a large cocoanut, when one night, a few minutes after retiring to rest, the patient was suddenly seized with excruciating pain about the genitals, which gradually disappeared in about half an hour. The penis rapidly swelled to three times its natural size. The next morning the patient was free from pain, the distended hydrocele had disappeared, the tunica vaginalis containing but a very little fluid. The prepuce and adjacent skin and cellular tissue were œdematous and swollen with fluid. A puncture was resorted to, a thin serum oozing away. In a few days the parts had resumed their natural state, and some months later there was no symptom of the disease returning.

The violence is often slight or unknown, as in the above case. In a very similar one, recorded by M. Réverdin, the patient was quietly sitting on a chair, when suddenly acute pain came on in the scrotum, causing him to faint. In others it has accompanied the act of defæcation, or a violent attack of coughing. Mr. Hussey (*St. Barth. Hosp. Rep.*, vol. xiv.) gives the following four instances of the accident which led to the rupture—viz., getting over a stile, a fall from a scaffold, a fall from a carriage, turning in bed. In one, the accompanying sound was compared to "the report of a gun," in another to "the bursting of a pig's bladder." A permanent cure seems to have followed in three of the cases.*

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* Pott, quoted by Curling, gives a case in which a confirmed hydrocele disappeared during the six weeks in which the patient, aged forty-five, was confined to his house by a severe attack of the gout. MM. Monod and Terrillon also mention cases in which spontaneous cure took place during an attack of small-pox, (Behrend, Virchow, *Arch.*, 1872, Bd. lv. S. 538); and of influenza (Gilis, *Gaz. Hebd. des Sci. Méd. de Montpelier*. 1885, t. vii. p. 317).

The rupture is nearly always subcutaneous, the scrotal skin not giving way. The rent in the tunica vaginalis is usually, judging from the few cases in which an early incision has given the opportunity of clearing this up, at the upper and anterior part. The evidence of this accident is usually clear enough. Pain varying in intensity is usually felt at once, while the shape of the swelling is noticed to have changed immediately, the scrotum becomes quickly swollen, soft, and œdematous; a little later on the skin of the penis, the groin, and hypogastric region, become ecchymosed, the colour varying in tint from violet to purple. Sometimes, owing to a larger leakage, the cellular tissue contains clots of blood. The treatment should, in cases where the patient is weakly, be directed to securing absorption of the fluid, by absolute rest, lead and opium, or hot boracic-acid lotion, gentle purging, and limited diet. Where the condition is that of a diffused hæmatocele rather than of a hydrocele, the surgeon may make use of a free incision and try and secure a radical cure, especially if the general condition is good. And the same steps must be taken if cellulitis and suppuration follow the above accident.

(3) **Inflammation** and **Suppuration.**—This is rare. It may come on without any known cause, especially when the patient is in bad condition. Occasionally it follows injury, or one of the other causes which have been already given (p. 131) as occasionally bringing about spontaneous cure of hydroceles. How slight may be the injury is shown by the following case, very briefly reported by Dr. Monk of East Bridgeford (*Brit. Med. Journ.*, 1888, vol. i. p. 133). J. H., aged fifty, had had a hydrocele for ten years. It had been tapped on three occasions, 14½ oz., 16 oz.,

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* In one case recorded by M. Serre (of Montpelier) the patient used to rupture his hydrocele voluntarily. When the swelling became large enough to be troublesome, he was in the habit of taking violent exercise, riding, &c., till the hydrocele gave way. This he had done over thirty times.

and, lastly, 17¼ oz. being withdrawn. The patient would never sanction the injection of iodine. While carrying a heavy basket he rubbed the rim of it against the hydrocele, which was about ready for tapping again. The whole sac inflamed, and then subsided; a fortnight later the scrotum, when examined, appeared quite natural.

Acute inflammation of a hydrocele, though rare, is of importance, partly from the surroundings of the region, the facility with which burrowing cellulitis and erysipelatous suppuration may follow, and partly because in broken-down patients the above may readily prove fatal.

In the above-given mention of suppurating hydroceles notice has only been taken of cases in which this complication has come on spontaneously. When the treatment of hydrocele is considered, instances of suppuration after puncture or the use of the seton will be mentioned.

Inflammation of a less acute kind, due to slight injury, repeated irritation, &c., may in some cases of hydrocele be the cause of the false membranes, the frequency of the existence of which has already been discussed (p. 105).

Considering how frequent are hydroceles, and how necessarily exposed they are to various slight injuries and constant irritation, it must be admitted that inflammation is of very rare occurrence. The bearing of this upon practice, especially upon radical cure which depends for its success on the securing of a certain amount of inflammation, is obvious (p. 106).

(4) **Transformation into Hæmatocele.**—This may take place under three following conditions:—(α) after tapping; (β) after a blow or violent strain; and (γ) insidiously and without known cause. These will be discussed together later, under Hæmatocele.

(5) **Effect upon the Testis and Epididymis.**—This matter has already, p. 114, been alluded to. As a rule, owing to the age of the patients, this is not a matter of much importance, especially as the hydrocele is usually one-sided. But in a few cases—*e.g.*, in a younger patient with a double hydrocele—it may be of great importance to know that there is reason to believe that a double hydrocele, especially if voluminous, may mechanically, by pressure upon the epididymis, and perhaps by causing flattening of the vasa efferentia (in Fig. 17 this change is commencing), bring about sterility by preventing the escape of the seminal fluid. This sterility is temporary, disappearing when the hydrocele is cured.

A case reported by M. Roubaud,[*] strongly supports this view. A man, aged twenty-six, with a large double hydrocele, was sterile, the seminal fluid containing no trace of spermatozoa. These reappeared after the hydrocele had been tapped. The fluid re-collected, and when the hydrocele again presented an enormous size, the spermatozoa again disappeared from the seminal fluid, reappearing after a second tapping. In the end the patient agreed to submit to injection of iodine, which at one and the same time cured him of his hydrocele and his sterility.

Dr. Fleury has shown (*Bull. de la Soc. de Chir.*, 1874, t. iii. p. 351) that in double hydroceles the above condition may go a little further, and that sterility may be due in these cases to induration and obliteration of the epididymis.

Other conditions which may play a part in the complication are the anæmia of the testis, which may be brought about in long-standing hydroceles as well as in hæmatoceles, and the mechanical interference of the hydroceles with efficient use of the genital organs.

Treatment of Vaginal Hydrocele.—It has been shown how rare in adults is the spontaneous cure of a hydrocele. In them, also, the use of external remedies—iodine, blistering, pressure—is invariably futile, and not without danger, owing to the risk of sloughing of the scrotum.

The treatment, therefore, resolves itself into—(A) **Palliative** and (B) **Radical** or **Curative.**

(A) **Palliative Treatment.**—This consists in drawing off the fluid from time to time. The period in which the fluid re-collects varies very much; usually a fresh tapping is required every four or six months. Each case must be decided by the patient's sense of discomfort, mode of life, &c.

Simple as this operation is, every precaution must be taken to avoid needless pain and the ill results which are mentioned below. A small sharp trocar, with a well-fitting cannula,[†] both scrupulously clean, are chosen, the position of the testicle is defined, and the skin of the scrotum cleansed with lotion of hyd. perch. 1 in 1000.[‡]

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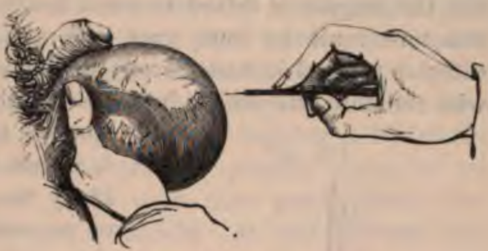
[*] *Traité de l'Impuissance et de la Stérilité*, 3rd ed. p. 576. MM. Monod and Terrillon quote a similar case, also cured by iodine injection by Desmoroux (*Gaz. des Hôp.*, 1883, p. 762).

[†] These should be scrupulously aseptic. Plunging them for a few minutes in boiling water, if they are otherwise in fitting order, will secure this result. If carbolic oil is used, both instruments must be carefully dried for fear of their rusting.

[‡] The tablets now sold everywhere afford a ready means of preparing this.

The surgeon then, sitting or kneeling in front of, and a little to the right of, the patient, makes the scrotum tense by grasping the neck with his left hand, sends the trocar with a stabbing movement into the front of the hydrocele at about the junction of the lower and middle thirds. In making the puncture, the forefinger of the right hand should be placed on the instrument about 1½ inch from the point, so as to prevent too deep a plunge. Any large veins should, of course, be avoided, and the trocar should be entered quickly and vigorously, so as to make sure of entering the sac, especially when this is thickened. The cannula, if rough or ill-fitting, is liable to push the tunica vaginalis before it instead of perforating it, this being made additionally likely if, from any wavering use of the instrument, the skin is first pricked and the patient draws back. The direction of the trocar should be at first directly backwards, and then, as soon as the sac is perforated, upwards, so as to avoid the testicle. The trocar is now withdrawn while the cannula is pushed onwards, the tension of the hydrocele being carefully kept up while the fluid flows away. If the scrotum is very retractile, no dressing is absolutely needed, the puncture through the deeper tissues being rendered subcutaneous by the movement of the skin. It is well, however, in order to prevent any risk of sepsis, and to save any drops escaping into the patient's clothes, to apply a little iodoform and collodion,* or aseptic wool, or a small bit of strapping, and the patient will be more comfortable if he keep the part suspended. The operation is best performed with the patient standing with his back against a wall, as this position best guards against any sudden movement on his part. It is well also in any case to be prepared for the possibility of the patient's fainting. He should

FIG. 21.



Tapping a hydrocele. (Osborn.)

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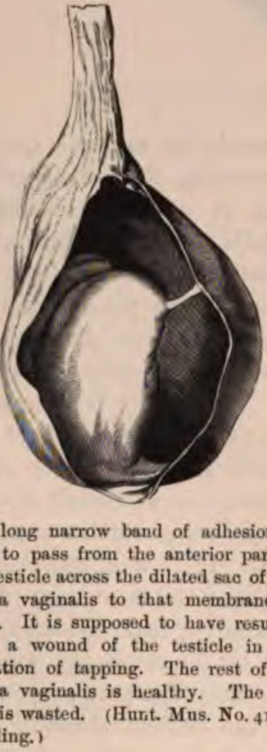
* It will be well worth while to take this little precaution, especially where the sac of a hydrocele is thickened and the patient in feeble state. These conditions perhaps supply some explanation of that rare but occasional complication sloughing, or suppuration, after a simple tapping (p. 137). It is possible that in such a case the puncture does not close so readily as usual when the cannula is withdrawn.

always be told to keep quiet, and to take as little exercise as possible for the first few hours. A hospital patient should also be warned against drinking. These points are especially important after a first tapping. Tapping a hydrocele should always be performed with a trocar and cannula; but where this is not possible, and the surgeon is driven to use a lancet or tenotomy knife, the puncture must be kept open with a director or medium-sized catheter (dipped in carbolic oil) as the sac empties itself, otherwise the fluid will escape into the cellular tissue of the scrotum. The use of the above instruments, it should be remembered, is more likely to wound a scrotal vessel, or to cause a hæmatocele than that of the trocar.

FIG. 22.



A long narrow band of adhesion is seen to pass from the anterior part of the testicle across the dilated sac of the tunica vaginalis to that membrane in front. It is supposed to have resulted from a wound of the testicle in the operation of tapping. The rest of the tunica vaginalis is healthy. The testicle is wasted. (Hunt. Mus. No. 4146.) (Curling.)

Complications or Accidents accompanying Tapping a Hydrocele.—Carefully performed tapping a hydrocele is, as a rule, as successful as it is simple. The following, however, must be borne in mind:

(*a*) *Puncture of the Testis* (Fig. 22).—This can usually only be due to gross carelessness, either beforehand from not defining the position of the testis, or at the time of the tapping from mal-direction of the trocar. The sequelæ: (1) Sickening pain, (2) hæmatocele, (3) orchitis (*q. v.*), are not trivial ones. (β) *Sudden Stopping of the Flow.*—This may be due to plugging of the cannula with lymph or clot; much more frequently it is also due to careless use of the instrument, the cannula having been allowed to slip out of the puncture in the tunica vaginalis. This may be brought about by the instrument being used timidly—*i.e.*, pricking the scrotum and not penetrating it, by the trocar and cannula fitting badly, and the latter being jerked out when the former is withdrawn, or by some sudden movement of the patient. The trocar being re-inserted, a fresh puncture must be made.

If much fluid has leaked into the scrotal tunics, absolute rest should be enforced with lead and opium or boracic lotion, the scrotum kept raised, and mild aperients given. (γ) *Hæmatocele* (*q. v.*). (δ) *Cellulitis and Sloughing of the Scrotal Tunics.*—Sir A. Cooper mentions two cases in which this took place, in elderly patients who had walked about after the operation. In both inflammation of the scrotum took place rapidly, ran on into gangrene, and destroyed the patients within the week. A lancet and not a trocar was used. The following cases have been recorded, and show that the operation of tapping a hydrocele, which is so lightly treated in the out-patient room, is not entirely free from danger. It is more than possible that other surgeons have not been equally candid. It will be seen that the three cases occurred under the care of well known hospital surgeons, that only one was an aged patient, and that this man died. In the first case, the history is suggestive of an acute septic condition having been set up by the trocar. The first two cases were under the care of Mr. Jessop (*Brit. Med. Journ.*, 1871, vol. ii. p. 439).

A man, aged twenty-five, was tapped as an out-patient at the Leeds Infirmary, with a No. 2 trocar, April 14, 1871. He came again three days later, and was admitted as an in-patient. A gangrenous patch, the size of half a crown, was seen at the site of the puncture, and there was suppuration in the tunica vaginalis. Wine, beef tea, and milk were given freely, a grain of opium being also taken twice a day and the scrotum poulticed. The sloughing however spread, till at the end of the week the whole scrotum was destroyed, and both testicles and the cords were exposed as high as the external abdominal rings. He was made an out-patient June 24, when the parts were nearly healed, and ultimately recovered completely.

G. B., aged seventy-one, was tapped as an out-patient, July 7, 1871, with a trocar of the same size as that used in the last case. July 14, he again presented himself. All the anterior part of the scrotum was then gangrenous, and he was in a very feeble and feverish condition. He was admitted and treated like the previous case. The gangrene spread so as to destroy the entire scrotum, and implicated the groins. No effort at repair took place, and the patient died, exhausted by the suppuration, on Aug. 12.

Mr. Dobson (*Brit. Med. Journ.*, 1872, vol. ii. p. 43) reports the following case: A man, aged fifty-two, a railway goods porter, by œdema, which often takes a week to disappear completely. I is inadmissible when the tunica vaginalis is much thickened Where the patient is very timid, acupuncture may be employed or where, as in Mr. Luke's case, he is compelled to live abroad, ou of the reach of any surgeon, he may be instructed how to perforn this operation upon himself.

B. **Radical Cure.**—The methods which have been brought forward for this purpose are extremely numerous.* I shall onl consider here: (1) **The Introduction of certain Stimulatin Substances**; (2) **Antiseptic Incision**, with partial excision of th sac. The extraordinary number of operative steps devised for th radical cure of hydrocele seems at first sight ridiculous, but ther is this excuse for it, that hydrocele is by no means so easily cure as would appear *à priori* likely in so simple and so localised disease. The fact that a large number of hydroceles are mos rebellious to attempts at radical cure will be alluded to late (p. 151). In this respect hydrocele is but the example of a clas In other diseases of a like kind—hydrocephalus, hydrothora hydrops articuli, &c.—the resistance to remedies is as great as i often is in hydrocele.

(1) **Introduction of Stimulating Substances.**—These are bot liquid and solid. (*a*) *Liquids.*—The variety made use of has bee very great; only two will be considered here—viz., iodine an carbolic acid. Either of these, if properly used, will suffice in th great majority of cases. Failure with them is usually due t neglect of important details, or to their use in inappropriate case

Iodine.—This substance, which has been very largely used fo the last forty years, was first introduced by Sir R. Martin, whe practising at Calcutta. Like other methods, it is liable to occasional failure. Sir R. Martin stated that in India the failur scarcely amounted to 1 per cent. I believe that in England, cases are watched, failures will be found to be more frequen chiefly owing to the fact that too dilute solutions are used. In paper written about fifteen years ago (*Lancet*, September 1, 187 I stated that of 44 cases which had been treated with iodi injection at Guy's Hospital, this method failed in 8 cases, an that in 2 it failed twice. Of 25 cases treated at St. Thomas Hospital, from whom Mr. Osborn (*Hydrocele*, p. 38) succeede in getting replies, recurrence took place in 18. Of 19 cases treate by Bardleben, only 65 per cent. were cured. Billroth in 115 cases had 6 recurrences, but out of the 115 only 38 had been carefully followed. Of 33 cases which have passed through my hands recurrence has taken place in 2. But I have not been able to follow up all my cases. Of the 2, recurrence in 1 has been slight and not increasing, in a man injected three years ago. In the other, the fluid recurred again after I had incised the sac (Schnitt method). This case was finally cured by again incising, and wiping over the tunica vaginalis lightly with a stick of silver nitrate. A surgeon will not be far beyond the mark if he is prepared for a recurrence of about 2 per cent. in a hot climate, and one of 8 or 10 per cent. in one like our own.*

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* Of these very numerous methods I shall only give in detail those which ha really been proved to be of value. The numerous others will be mentione chiefly to prevent any who may think they are novel making use of them.

While the absolute certainty of iodine injection has been overestimated by some writers, there is no doubt that failure has been courted by want of the following precautions: (*a*) The use of too dilute a solution; (*b*) not withdrawing all the hydrocele fluid; (*c*) injecting large hydroceles immediately after they are tapped; (*d*) not bringing the solution in contact with the whole of the sac; (*e*) making use of this method in unsuitable cases—*e.g.*, cases where the testicle or its appendages are not in a healthy condition, or where the walls of the hydrocele are much thickened.

The Method of Injection with Iodine should be thus carried out:—If the patient is very nervous, cocaine may be used thus:—The site selected for puncture is brushed over with a 20 per cent. solution, and after the fluid is drawn off, 5 grains, dissolved in about a drachm of water, are injected through the cannula. In about five minutes the iodine may be injected, usually without pain or fear of constitutional symptoms. The action of the iodine is not interfered with. The surgeon makes sure that he has everything which he may require handy. He first draws off most carefully all* the fluid with a medium-sized trocar into a glass measure, then by means of a glass† syringe, holding about half an ounce, with a platinum nozzle accurately fitting the cannula, he injects steadily from two to four drachms of the Edinburgh tincture of iodine,‡ taking care first that the cannula is pushed well into the cavity of the tunica vaginalis. As soon as the fluid is thrown in, he plugs the cannula with a small wooden spigot, while the affected side of the scrotum is carefully raised, and gently manipulated and shaken, so as to bring the iodine in contact with all the interstices and folds of the tunica vaginalis. If the pain § is not excessive, the cannula should be retained for ten minutes, and the part manipulated from time to time; the cannula is then withdrawn,‖ about half the iodine injected being left in the sac. But if the suffering is severe, the cannula must be withdrawn earlier, most of the fluid having been allowed to escape first. While the cannula is removed, the puncture must be held firmly round it, and then closed with iodoform and collodion or a bit of strapping. A feeling of heat is always noticed on the introduction of the fluid, sometimes amounting to pain of a sickening character, referred to the part and also to the inguinal and lumbar regions, occasionally to the neck of the bladder. To make sure of drawing off all the hydrocele fluid I prefer to have the patient in the erect position, but there is no objection to allowing ether and the recumbent position to one who dreads the operation.

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* It should be mentioned that many statistics which have been published give better results than the above. Thus, Prof. Billroth (*Clin. Surg.*, p. 290) states that in 125 cases of iodine injection he has never seen recurrence, and adds that during his whole surgical experience no patient has ever come before him with a hydrocele recurring after injection by another surgeon. M. Gosselin gives only 6 per cent. of recurrences out of 149 cases treated by him between 1862 and 1878. M. Stolz, out of 265 cases treated at Kiel between 1858 and 1883 found that only 2 per cent. recurred. M. Duplay, who uses undiluted iodine, affirms that he has not had a single recurrence. With regard to such results, I would again draw attention to the following:—(1) That hydroceles must be watched for a very long period (much longer than that usually adopted) before a radical cure can be counted on. The case of Sir A. Cooper, mentioned at p. 145, a recurrence took place after twenty-five years. (2) That some hydroceles are remarkably rebellious, and that there is no method, not even incision and partial excision of the sac, which can be relied upon in all cases to give a permanently successful result (foot-note, p. 151).

Much weaker solutions of iodine than that above given are generally used. Thus, Sir R. Martin used ʒij to ℥vj of water. Mr. Gould recommeds 40 gr. of iodine, 30 of potassium iodide in an ounce of water, of which 1 to 2 drachms are to be injected. In France the solution commonly used is called "au tiers," one-third of iodine being added to two-thirds of water. Sufficient potassium iodide is added to prevent any iodine remaining suspended in the water. I believe these weaker solutions to be an entire mistake in healthy adults. In them, as a rule, it is too little rather than too much inflammation which is excited. If iodine injection is made use of in weakly elderly subjects, or in children, it should be diluted.

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* Any fluid which is left behind will not only dilute the tincture of iodine, but also cause partial coagulation of it.

† Mr. Curling (*loc. supra cit.*, p. 129) advises that if a silver instrument be used it should be immediately cleansed by dipping it in a solution of hypophosphite of soda (ʒj-ʒj), which will prevent the action of the iodine on the silver. This solution will also be found useful in removing iodine stains from the finger.

‡ The following is its composition: Iodine ℥iijss, rectified spirit Oij.

§ Sometimes the pain, severe at this time, soon disappears, to return in about twenty-four hours.

‖ This should be done quickly, the soft parts being carefully held around the cannula as it is withdrawn. The puncture should be treated as directed in the case of simple tapping (p. 135).

Attention will be drawn a little later to the fact how rebellious some hydroceles are.

The after-treatment depends on the amount of the inflammation. This usually appears within three or four hours. Sometimes its appearance is delayed for six, twelve, or twenty-four hours. But if inflammation is deferred beyond the first few hours, the ultimate result is rendered additionally uncertain. The condition hoped for should be that of a moderate vaginalitis, the part being again swollen, even to the same extent as before, and the scrotum somewhat hot, tender and painful. If evidence of inflammation be not present within an hour or so of the injection the patient should be told to walk about, and the sac again manipulated. When inflammatory action has set in, the patient should be kept for a few days to his bed or sofa, the scrotum supported, and light diet given. The surgeon should be in no hurry to supply ice, this being only made use of if the pain is really excessive. On the third or fourth day, usually, the symptoms begin to decline, and the patient may get about again, wearing a suspensory bandage. He must always be prepared for a return, and for some persistence of the swelling after the operation, and otherwise he will be disappointed at what he considers a recurrence of his disease. The swelling begins to decrease after a fortnight, and by the third or fourth week has usually disappeared. If the inflammation should really threaten to run high (p. 137), especially in a patient of weakly or otherwise unsatisfactory condition, the treatment must be on the lines indicated at p. 132.

It is always worth while to strap the testis after injection as soon as the patient can bear it—*i.e.*, from about the fifth to the fourteenth day—and to continue this every few days for some weeks. And the patient who wishes to give the injection every chance should wear a suspender, regularly, afterwards.

In the case of *a double hydrocele*, if the patient be healthy and not advanced in years, both sacs may be injected at the same time, the cases in which one injection has cured both sides being too few to encourage any reliance on this step. Where the patient is weakly or elderly, if palliative treatment does not suffice, the injections should be separated by an interval, or antiseptic incision and partial excision of the sac (p. 154) made use of.

Complications and Sequelæ of Iodine Injection.—Some of these—*e.g.*, puncture of the testicle—are the same as in simple tapping (p. 136). The most important are—(1) **Escape of the iodine into the scrotal tunics**; (2) **Suppuration of the sac**; (3) **Very slow absorption of the hydrocele**; (4) **Re-collection of the fluid.** (1) **The escape of iodine injection into the scrotal tunics** is entirely the fault of the operator. The surgeon may always feel sure that he has not reached the tunica vaginalis as long as any resistance remains to the point of his trocar. Further, when the iodine is being injected, which should always be done by the surgeon himself, the fluid should be felt to pass in easily without obstruction.

Attention has already been drawn to the necessity of pushing the cannula well into the tunica vaginalis before the iodine is thrown in; if by mischance any escape into the cellular tissue of the scrotum, punctures should at once be made, and hot boracic acid fomentations constantly applied, as the risk of sloughing is now, in patients at all advanced in life, very great.* (2) **Suppuration of the Sac.**†—This complication is very rare after iodine injection, partly, from the antiseptic nature of the fluid. The suppuration may be explained by inflammation running unusually high, by vascular walls which bleed readily (hæmorrhagic vaginalitis), or by very thick evascular, over which slough only an unhealthy condition of the patient. If suppuration threaten, rest in the recumbent position, with the scrotum well raised, must be rigidly enforced, boracic acid lotion, iced or hot (according to the feelings of the patient), *frequently* applied, free purging made use of, and low diet given. If these measures fail, a free incision should be made use of, with antiseptic precautions, as this step will not only save the patient from the grave risks of cellulitis and sloughing, but will also give him a very good chance of radical cure. (3) **Very Slow Absorption of the Fluid.**—While, as a rule, the scrotum should have recovered its natural size in a month, occasionally complete absorption of the fluid is delayed two or three months. As this delay, though in the end followed by success, will be very annoying to active patients, and as the swelling will remain liable to irritation and suppuration, it should be tapped with a fine trocar and strapping applied. (4) **Recurrence.**—This has been already spoken of (p. 140), and some explanations of the fact given. Two more points must always be remembered—(1) That there is no treatment for hydrocele, however severe, which has not, in some cases, been followed by relapse. (2) That recurrence may occasionally take place many years after injection. Thus a case was tapped by Mr. Curling, which had been "cured" by injection* by Sir A. Cooper twenty-five years before, the hydrocele having returned only in the previous six months. If after a recurrence it is intended to repeat the iodine injection, at least six weeks should be allowed to elapse. This will not only determine the results of the first injection, but it will obviate one danger which lies in repeating the injection earlier—*i.e.*, of causing hæmorrhage from any false membranes which may exist, and thus suppuration of the sac.

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* In a diabetic patient, the puncture with the trocar used in injection of iodine has been followed by a local patch of gangrene. Prep. 4145, R.C.S. (from Liston's Museum) shows two testicles from the same person. Each tunica vaginalis was the seat of hydrocele. The patient was aged. In the operation for radical cure by injection of the sacs, some of the fluid injected escaped into the cellular tissue, and produced such severe irritation, local and general, as destroyed life.

† Mr. Curling (*loc. supra cit.*, p. 141) said that he had never known or heard of an instance of suppuration after the employment of iodine. MM. Monod and Terrillon (*loc. supra cit.*, p. 195) state that M. Gosselin, after 149 hospital cases, could say the same. Prof. Billroth (*Weiss. ueber die Erderfolge der Radical Operation der Hydrocele, in Wien. Med. Woch.*, 1884, No. 1, p. 8) out of 115 cases had suppuration in 5. I have had only one case of suppuration, and that occurred sixteen years ago in a case in which I distended the sac with hospital port wine, iodine injection having previously failed. The sac was laid open, and the patient made a good recovery.

Carbolic Acid.—This method was introduced in 1881, by Dr. Levis, of Philadelphia (*Boston Med. and Surg. Journ.*, 1881, vol. cv. p. 540). The following advantages have been claimed, and in my opinion largely substantiated: (*a*) It is less painful than iodine. (β) It is more certain. Thus carbolic acid produces almost uniformly the proper degree of inflammation, neither falling short nor exceeding that needful for producing plastic lymph. When I met Dr. Levis in England a few years ago, he told me that of all the scores of cases in which he had used carbolic acid, none had been followed by recurrence. (γ) There is less risk of sloughing. (δ) The patient is only kept from his employment for a day or two, and sometimes for a shorter time than this, or even not at all.

While the above advantages of carbolic-acid injection over that by iodine, especially the fact that it entails a much shorter rest and absence from business, have, in my opinion, been largely substantiated, it is certain that complications and undesirable sequelæ, while less frequent, are not so entirely uncommon as some partisans of this method would have us believe. (1) **Recurrence.**—With regard to this matter, I would point out that a large number of cases have been published as radical cures within a year or so of the first introduction of the method. Thoughtful surgeons who have seen much of radical cure of hydroceles will not need that I should refer them to the remarks which I have made on the rebellious nature of many hydroceles, and how they must be carefully watched for an extended period before a radical cure can really be claimed. It is beyond the bounds of probability that while a hydrocele will recur after careful incision and drainage (p. 151), and even after incision and partial excision of the sac, yet injection of carbolic acid will be invariably and permanently successful. And it is interesting to note that in America itself, where this method has been most largely used, and where surgeons have had the largest opportunities of watching its results, they are not in entire accord as to its value. Thus Dr. Bull, of New York (*Ann. of Surg.*, July 1886, p. 35), in a paper recommending antiseptic incision, writes, "It is a striking fact that of the thirteen cases I have met with, two had been treated unsuccessfully in this way. As it attempts a cure by the same process as that incited by iodine, an adhesive inflammation, I see no reason to believe that it will ever yield much better results." Dr. R. F. Weir, in the discussion that followed on the reading of the above paper, said he had used carbolic-acid injections over sixty times. Occasionally relapses had occurred, not in a large proportion, however, as he could recall only four or five instances, and in those the patients were cured by a repetition of the same treatment. In three of these the injection was repeated too soon, as subsequent experience showed that a longer delay would probably have resulted in a cure. Helferich, of Griesswald (*Therap. Monatsschrifte*), 1890, has tested carbolic-acid injection by Levis' method in over 30 cases, with known results in 27: 21 were cured, 6 relapsed; all of these latter, save one, being cured by a fresh injection.* (2) **Much Reaction. Cellulitis and Suppuration.** — It is right to say that in some of the cases in which this has followed on the injection of carbolic acid an excessive quantity seems to have been employed. Thus Dr. R. Abbe (*New York Med. Journ.*, Dec. 22, 1883) reports that he injected 3 drachms of carbolic acid and glycerine into a large hydrocele sac, and that acute suppuration followed, requiring incision, which cured the hydrocele. He allows that the above quantity is excessive, 1 drachm always sufficing. Dr. Weir (*loc. supra cit.*) in one case in which the iodine treatment had failed, injected 3 drachms of carbolic acid, which was followed by the usual absence of pain, but with recurrence of the swelling in a few days, which went on to suppuration, and after incision of the sac, shreds and large masses of membrane were discharged, gangrene of nearly the entire tunica vaginalis being produced. Dr. Port narrated before the New York Surgical Society, October 2, 1882, the case of a man, aged fifty, with a large hydrocele, which was drained and injected with 3 drachms of equal parts of glycerine and carbolic acid. Two days later the scrotal tunics were enormously distended and livid. The swelling, however, gradually subsided without suppuration.

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* The fluid is not mentioned. It was probably port wine or zinc sulphate solution.

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* Mr. Southam (*Lancet*, 1887, vol. ii. p. 515) mentions a case which recurred within the month of the injection with carbolic acid and was then treated by antiseptic incision and partial excision of the sac.

M. Monod (*Le Semaine Médicale*, 1889, vol. ix. p. 429) injected about a drachm of carbolic acid into a simple hydrocele in a patient aged thirty-eight. After fourteen days the scrotum became swollen and very painful, with lymphangitis of the cord and pubic region. A puncture of the tunica vaginalis withdrew a brownish liquid, with shreds of fibrine and some pus cells. Incision of the scrotum found no pus. Two days later the tunica vaginalis was incised, and found lined with false membrane. This was removed, and a cure followed. Helferich, of Griesswald (*vide supra*), had an accident with his thirty-second case. The patient was aged thirty-four, and about 1 drachm of carbolic acid was injected. The same evening the scrotum attained the size of an adult head. A puncture being made without result, the parts were incised. The cellular tissue was infiltrated with blood, the tunica vaginalis full of brownish serum, and its inner surface was whitish, as if cauterized. The testicle was removed, and the patient recovered. The tunica vaginalis had the thickness and consistence of parchment. It had not been attacked in its whole extent by the caustic, a very thin zone of unaltered serous membrane being found between the part affected by the acid and the testicle. Helferich attributed the result in this case to hæmophilia, though no evidence in support of this view is given.

The above cases of Weir, Monod, and Helferich show that accidents have followed even when the amount of carbolic acid used is small. They suggest that considering the comparatively recent introduction of this method, and the restricted number of surgeons by which it has been used, that complications are at least as frequent as after iodine injection.*

(3) **Carbolic Acid Poisoning.**—Most writers have distinctly stated that this does not occur. It is certainly extremely rare, as it is probable the surfaces are sealed by the carbolic acid. But Dr. J. Murphy, at a discussion at the New York Association (*N.Y. Med. Rec.*, June 20, 1891), said he had known of three or four cases in which carbolic acid used in this way was followed by bad effects, especially on the kidneys. He had seen one case terminate fatally, and he could not attribute this death to anything but carbolic-acid poisoning. He did not know how much carbolic acid was used.

After the usual tapping,† Dr. Levis, by means of a syringe which has a nozzle sufficiently long and slender to reach entirely through the cannula, injects about a drachm of crystals of carbolic acid, which must be kept liquid by a five or ten per cent. addition of glycerine or water. The former should be preferred. No more fluid is to be used for dilution than is absolutely necessary. Liquefaction by heat is inadmissible, as solidification is in this case liable to follow in the cannula. As soon as the carbolic acid is lodged in the sac, the scrotum is freely manipulated, so as to diffuse the carbolic acid uniformly. A sense of warmth is produced, quickly followed by decided numbness.‡ Twenty-four hours is the most which many American surgeons affirm that patients need stay away from their business, but it is evident that occasionally sharp inflammatory reaction and rapid re-accumulation of fluid requiring withdrawal must be expected after this method.

By some the carbolic-acid solution has been somewhat differently used. Thus Dr. Millikin (*N.Y. Med. Rec.*, June 20, 1891) has employed injections of 10–20 minims of equal parts of carbolic acid and glycerine, repeating the injection if needful. Of 54 cases 9 were never seen again, 5 paid only one visit, and 4 were at present under observation. It was claimed that the remaining 36 were completely cured. Of these 26 had one injection, 5 had two, and 5 had three injections.

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* Dr. Sipthorpe (*Brit. Med. Journ.*, 1889, vol. i. p. 411) mentions two cases injected with carbolic acid at the Madras Hospital. In one a good deal of pain and swelling followed, and a small abscess which formed at the seat of puncture was followed by a sinus which necessitated prolonged after-treatment. In the other suppuration followed, requiring a free incision and drainage. Recovery followed. Albert (*Beitrag. zur Statistik d. Hydrocelen, Inaug. Disser.*, Berlin, 1883) quotes two fatal cases.

† The preliminary use of cocaine (see p. 141) will not be required here, on account of the little pain.

‡ No drops of the carbolic acid must be allowed to fall on to the scrotum, or troublesome irritation may be set up.

An interesting case, in which it is claimed that carbolic acid succeeded where iodine had failed, has been published by Mr. Buckston Browne (*Brit. Med. Journ.*, 1886, vol. ii. p. 1214). A patient, aged twenty-three, had hydrocele "which had followed an attack of orchitis fourteen months before." April 13, six ounces were drawn off, and 2 drachms of tr. iodi injected. Next day the parts were painful, tender, and full, and in four days 2 ounces of fluid were again drawn off by tapping. April 20, as the fluid had again collected, the hydrocele was again tapped and injected with 1 drachm of pure carbolic acid, liquefied with 5 per cent. of glycerine. Next day the parts were swollen, but not very tender, and after this no fluid again collected. The cure is claimed to have been rapid, complete, and nearly painless, but of after-watching there is no mention.

My own experience is too limited to be of any value. Of late years I have used antiseptic incision with partial excision of the sac, and have been so well satisfied with it as to prefer to use it wherever the patient can lay up. But where this is objected to, I have used iodine and carbolic acid, but the latter only in 5 cases. As it is difficult to obtain Levis' syringe, it may interest some of my readers if I state that there is no need of this special instrument. What is essential is to use carbolic acid liquefied with glycerine, not to inject more than 1 drachm, and to lodge it well within the tunica vaginalis. This may be done by means of one of the large exploring hypodermic needles, which hold 60–100 minims.*

The needle attached to the syringe is first lodged safely in the cavity of the hydrocele, which is then tapped in the ordinary way with a fine hydrocele trocar.† When the sac has been thoroughly emptied, the cannula is withdrawn, and the syringe containing the solution must be screwed on (previously cleansed) to the needle, which has been kept *in situ*, and the solution injected. However this is done, the carbolic acid must be brought in as complete contact as possible with the interior of the sac, by manipulating the scrotum, turning this from side to side, upside down, &c. I have employed strapping later, as after the use of iodine. The absence of pain and inflammatory reaction has certainly been striking, but as in none of the cases have more than nine months elapsed since the injection, they must be further watched before a cure is claimed for any of them.

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* I learnt the value of these in small hydroceles, as in those of the cord, or the infantile variety in boys, from the late Mr. Berkeley Hill (*Brit. Med. Journ.*, 1886, vol. i. p. 1164). Following Mr. Hill, I have also given an anæsthetic in children.

† Dr. Keyes (*N.Y. Med. Rec.*, Feb. 10, 1886, p. 204) uses a fine aspirating needle.

(β) **Solids. Silver Nitrate.**—This is a very efficient mode of treating hydroceles, which we owe to French surgeons.* The hydrocele being emptied in the usual way, a tiny scoop containing a little silver nitrate fused in the cavity at the end in the flame of a spirit lamp, or a probe which has had some of the salt fused on it in the same way, is introduced through the cannula and quickly rotated inside the collapsed tunica vaginalis for a few seconds, so as to bring the silver nitrate in contact with the serous membrane at several points. The probe or scoop is then withdrawn and lastly the cannula. The puncture is then closed as directed at p. 135.

I have myself only used silver nitrate in recurrent cases of hydrocele as in one which had returned quickly after antiseptic incision performed after the method of Volkmann, many years ago. I again opened the sac and wiped it over lightly and quickly with a probe coated with silver-nitrate. A good deal of pain followed, with a moderate amount of orchitis, but the cure was certainly permanent when I saw this patient last three months after he left the hospital. Since then I have used the silver nitrate in stick in cases treated by partial excision of the sac, preferring it for sureness to a solution of zinc chloride or pure carbolic acid.

Antiseptic Incision. Antiseptic Incision with Partial Excision of the Sac.—These two methods will be considered together. The latter is often spoken of as excision of the tunica vaginalis. As the parietal layer of the serous membrane can alone be removed, I prefer the above title. The treatment by incision is one of the oldest of all the methods for the radical cure of hydrocele. In former times,† after a free incision, the cavity of the tunica vaginalis was stuffed with lint, a proceeding too often followed by acute inflammation of the sac, and septic results which brought the method into deserved disfavour. More recently the treatment of hydrocele by antiseptic incision was, under the influence of Sir J. Lister's teaching, brought forward by Volkmann (*Berlin. Klin. Wochensch.*, 1876, No. 3; *Deut. Zeit. f. Chir.*, July 1876) and used largely in this country. A little later, it being found that the simple incision method was not absolutely to be relied upon, a further step was taken and the parietal layer of the tunica vaginalis removed as well. Before describing the method, I will speak of its advantages and disadvantages.

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* M. Pefer, of Metz, seems to have been the first to use this method. M. Désormeaux adopted it and a paper by him will be found in the *Revue de Thérap. Médico-Chir.*, 1885, Février 15, p. 88.

† Mr. Samuel Sharpe, one of the first surgeons at Guy's Hospital, describes four cases treated by the old method of incision (*Operations of Surgery*, 1739).

A. **Advantages.**

(1) Its greater **certainty.** While it is right to remember that no method can be absolutely relied upon as radical, and that hydroceles have recurred even after incision and partial excision of the sac,* there seems no doubt that a method which freely exposes the cavity of the tunica vaginalis, thus enabling the surgeon to deal with any morbid conditions present, which drains the cavity entirely with absolute certainty, and thus leads to rapid shrinking of its walls, leaves a much smaller secreting surface to be altered. A method which further removes a large part of this secreting surface must *à priori* be surer than those methods which do their work as it were in the dark, in some of which the drainage must needs be imperfect, the quantity of any irritant employed necessarily limited, it thus remaining doubtful how far the injection has been weakened by dilution or chemical change, and how far folds of the inner surface of the tunica vaginalis have entirely escaped inflammation. On this account I prefer to use this method in all cases of radical cure where the general condition of the patient is satisfactory, and where he is willing to lay up for a week in bed and a week on the sofa.

The **cases** to which this method appears to me to be **especially suitable** are those where (α) iodine or carbolic acid have previously failed, (β) where the sac is very large or has very thick walls. Where the sac is simply very large, but not much thickened, it can be safely and successfully injected, if this is preferred, by tapping first and then allowing only an interval of two or three weeks to elapse before the sac is injected. But if the walls are much thickened, there are the risks that after tapping they cannot collapse readily, and so be brought in contact with the irritant, and, while in a sac like this it is always uncertain if the due amount of inflammation will be secured, there is also a risk that owing to the little vascularity of a thickened sac sloughing may take place. (γ) Where on account of ill-health* or age the risk of inflammation after injection of an irritant is especially to be dreaded. (δ) Where the surgeon is desirous of exploring the sac of the tunica vaginalis, as in cases where enlargement of the testis of a doubtful nature coexists with hydrocele, and does not yield to ordinary treatment, where a hæmatocele has supervened on a hydrocele, or in the much rarer cases of loose bodies in the sac of the tunica vaginalis. (ε) Where several hydroceles co-exist—*e.g.*, either double hydrocele of the tunica vaginalis, or a vaginal and encysted hydrocele. (ζ) In certain cases of hydrocele complicated with hernia—*e.g.*, (1) in young subjects where a radical cure of both is desired, (2) in much older patients, where the hernia is irreducible, where, especially in unhealthy patients, there is a risk of the inflammation set up by the injection extending to the sac of the hernia. (η) In cases of congenital hernia a careful incision with antiseptic precautions will be safer than any other method of radical cure if the pressure of a truss for the obliteration of the communication with the peritonæal cavity cannot be persevered with. And the same course will be wise in the case of encysted hydroceles of the cord, when their surroundings, mobility, and the difficulty of steadying them before injection are considered.

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* On this point a valuable paper by Mr. Morris, followed by an interesting discussion (*Med. Chir. Soc.*, Feb. 28, 1888), should be consulted (*Brit. Med. Journ.*, Mar. 3, 1888). Two cases of recurrence after partial excision of the sac were related. Mr. Pollock mentioned one even more extraordinary. This recurred repeatedly, *i.e.*, after two injections with iodine, the introduction of a silver wire seton and "ample suppuration": finally, the sac was laid open and lint inserted for a fortnight. The hydrocele again recurred and the patient declined any further treatment than simple tapping. Silver nitrate (p. 150) was not tried in these cases.

B. The **disadvantages** of this method must next be considered. (1) As shown in my paper (*Lancet*, Sept. 1, 1877) it undoubtedly involves more **trouble** than that by injection. While it can be completed in a quarter of an hour, an anæsthetic will be required, and there is also the trouble of the subsequent dressings, and there is also more need of absolute rest. Thus the patient will be confined to his bed for a week or ten days, and after this will have to keep quiet on a sofa or in an armchair. (2) With regard to the amount of **subsequent orchitis, pain**, swelling, &c., I am of opinion that this varies as much as after iodine injection. In the early days of this method—the Schnitt method of Volkmann—when after incision of the tunica vaginalis this cavity was carefully plugged with strips of aseptic gauze to promote changes in the serous membrane, orchitis to a painful degree was not uncommon; but of late years when, after incision of the sac, the parietal layer of the tunica vaginalis is gently detached from the scrotum and cut away close to the epididymis and the testis, the cut edges being stitched to the cut edges of the skin, I have been extremely struck by the very small amount of pain suffered, in spite of the disturbance, and the handling entailed of the parts concerned. (3) With regard to **the duration of the after-treatment**, this is in favour, but not so distinctly as would appear at first sight, of the injection method. With regard to the injection of carbolic acid, this is most certainly so (p. 145). Iodine has also an advantage in time less clearly marked. Thus, after injection with carbolic acid, the patient may perhaps not have to lay up at all. After forty-eight hours he will probably be able to follow his employment if not an arduous one. After the use of iodine the patient will probably be able to get about after the first week.* But these dates are only approximate; even with regard to carbolic acid it is impossible to read through a large number of cases reported by American and other surgeons without seeing that inflammatory reaction, crippling to locomotion, does occur more frequently than would be gathered from the reports of those surgeons who have advocated it most strongly. And again, as is shown above, while carbolic acid is extremely convenient, it is clear that there is no absolute certainty about it, and that repeated injections have been called for in many cases. After iodine injection the scrotum is often not its natural size, and the patient not free from all encumbrance till between the second and the third week. By this time, after antiseptic incision, the patient may get about, though a superficial granulating surface may very likely be left for seven or ten days later. (4) As to the risks of hæmorrhage, cellulitis, sloughing, which have been described by some writers,† I can only say that I have never seen them in an experience of 18 cases of antiseptic incision, and of antiseptic incision and excision of the sac. (5) Of the complication of **orchitis** I have already spoken. (6) Another condition which may cause temporary discomfort, and which I saw several times in my cases, when using the carbolic spray and gauze, is **erythema** and redness of the scrotal skin and about the wound. This always yielded to the use of green protective and salicylic cream. Since using dilute hyd. perch. irrigation and salalembroth, or iodoform gauze dressings, I have not been troubled with the above complication.

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* In one of my cases the patient, aged forty-five, and much let down, had two carbuncles on his neck. The hydrocele did perfectly well after antiseptic incision, the carbuncle healing while the sac was filled up. The patients' malnutrition delayed the complete healing considerably, this occupying from Dec. 28, 1876, to Feb. 26, 1877.

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* Voscoinekel (*Centr. f. Chir.*, 1890, Hft. 10, p. 192) has collected 90 cases in the practise of Czerny. In 48 of these iodine was used, the mean duration of hospital treatment was 7–8 days, and 6 cases recurred. Of 25 cases of incision, the mean duration was 23 days, and 1 case recurred. For numerous statistics on this and other points, an interesting paper by Mr. M'Ardle (*Dub. Journ. Med. Sci.*, vol. lxxxiv. p. 190) may be referred to.

† Albers (*Beitr. zur Statis. d. Hydrocelen*, Berlin, 1883) speaks of having met with 3 cases of phlegmonous cellulitis and 3 of gangrene of the tunica vaginalis

The Method of Antiseptic Incision with Partial Excision of the Sac.—The patient being prepared for the operation, the parts, shaved and well cleansed with soap and water used with a flannel and then washed with a dilute solution of carbolic acid or mercury perchloride,* ether, or A.C.E. are given. The surgeon, the scrotal tunics being made tense by his left hand or by an assistant, incises† them down to the hydrocele, from the top to the bottom of the swelling, and then before opening this arrests any bleeding points by applying Spencer Wells' forceps. The hydrocele is then opened sufficiently to admit a finger, which makes out definitely the position of the testicle; the tunica vaginalis is then freely but carefully slit up with blunt-pointed scissors. As when the hydrocele is opened the fluid escapes with much force, the sac at once collapses into folds, and scissors will be found preferable to the knife. The incision into the tunica vaginalis should be as free as is safe, for a free incision will at once admit of rapid removal of the parietal layer, and a thorough examination of the recesses of the serous sac. If a small one only is made, owing to the contraction of the dartos, the above steps will be found impossible. Further, a large

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in 46 cases. A very well-known American surgeon, Dr. W. T. Bull (*N.Y. Surg. Soc.*, Feb. 23, 1886) related 14 cases, with 2 deaths. One of these was due to mercury perchloride poisoning, the other to peritonitis; in this case, the operation for radical cure of hernia was also performed.

* As it is of the utmost importance that there should be no irritation, or erythema set up, which may cause discomfort and subsequent restlessness and also suppuration and slowness of healing, the antiseptic solution, which are all irritants, should be used both before or during the operation, as dilute as is safe to the very delicate scrotal skin—*e.g.*, carbolic acid 1 in 30, and mercury perchloride 1 in 3000. For the same reason no scrubbing with a nail-brush is advisable. These may seem trifles, but they may have a very important bearing on the after-result. To promote relaxation of the dartos and prevent contraction, and thus curling in of the skin, warm and not cold solutions should be used.

† The position of the testis should first be made out by translucency. The more showy step of opening the hydrocele at one cut might endanger the cord and testicle.

incision is, by the above, soon folded into a small space, and heals as quickly as a small one. Spencer Wells' forceps are then applied to every bleeding point in the cut edges of the sac. There should be no hurry to tie these off, as many of the vessels will be closed by the sutures which unite the cut edges of the tunica vaginalis to those of the skin. The forceps on either side serving to widely open out the wound, the testis and epididymis are examined for any cysts, sometimes present about the head of the latter. The inner surface of the tunica vaginalis is carefully scrutinised for any fibrous bodies attached or loose in any of its folds, or for false membranes and thickenings. As any of these may, by keeping up irritation, lead to a recurrence of the hydrocele, they should be dealt with, the cysts being snipped away after ligature of their pedicles with fine catgut. The parietal layer of the tunica vaginalis is now gently detached,* or peeled away from the scrotum as far as is safe—*i.e.*, close up to the epididymis on the outer, and to the back of the testicle on the inner side. Along these limits it is snipped away with scissors, and forcipressure applied to all bleeding points.

If any false membranes are now present over the testicle and epididymis or the small part of the parietal tunica vaginalis that remains, these are to be detached with a sharp spoon. The bleeding which follows may be smart and require very hot solutions of mercury perchloride, or firm pressure with a sponge. Different ways of closing the wound have been employed. M. Juillard leaves the cut edges of the serous sac long and sutures them together, taking care that they are in careful apposition throughout, so that by their fusion together no serous cavity shall be left in which fluid may re-collect. In all my cases I have followed Bergmann, and having cut away the serous sac freely have sutured its edges to those of the skin with stitches of fine catgut. But I have gone further, knowing how rebellious some hydroceles are (p. 151,) and I have, after thus suturing the tunica vaginalis and skin, wiped over what is left of the parietal layer of the latter and the visceral layer on the testicle, with silver nitrate. I have not found that this has been subsequently followed by orchitis or pain.

A larger experience is required to test the value of the above method. The method of Juillard, in which the testicle is still surrounded by a serous sac, the surfaces of which are intended to adhere by being kept in close apposition, seems likely to promot rapid healing, and M. Juillard thinks that by keeping the serou surfaces in contact, obliteration will be secured, and thus no drainage tube required ; he accordingly sutures the lips of the ski wound separately and only leaves a drain in here. No doubt hi cases seem to support his view, for he publishes 54 cases and say he has seen no return, "Jamais non plus de réchute." At anothe place he speaks of having seen 16 of these after the operation and that there was no recurrence ; but here too there is no mentio of dates. Far too frequently the closing words of the account o each case are such as these, "Le huitième jour, tout était fini"— "Le malade quitte l'hôpital le onzième jour," &c. The immediat results were most excellent, but the cases have not been watche sufficiently long afterwards to justify their being looked upon a permanently cured, or to allow us to judge of the value of th method by which M. Juillard treats the tunica vaginalis.

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* Great care must be taken here; rough handling will be very likely to lead to cellulitis and suppuration. There is usually very little bleeding.

On the other hand, if the parietal layer be freely cut away, it i evident that the testicle, covered by its visceral layer will be lef in contact with what may be described as the raw inner surface o the scrotal tunics, from which the parietal tunica vaginalis ha just been stripped. Now, we are not, as yet, in a position t know what happens here. Does a fresh smooth surface for opposite to the visceral tunic, or, as is more probable, do th scrotal tunics become adherent to this more or less extensively And if so, may we rest content with this and hope no fresh cavit exists for re-collection of fluid, or is it possible that this subsequen surrounding of the testis with scar tissue may have an injuriou effect upon its nutrition and function ? In other words, is i possible that this what one may call a state of cicatricial periorchitis, may by gradual contraction on the delicate tissue of th testicle risk its subsequent atrophy. I should admit that afte suppuration and granulation formation, the adhesions might b so close and dense as to contract upon, produce anæmia, an finally atrophy of the testicle. The preceding conditions, as t amount of inflammation, absence of suppuration, and the subsequent surroundings of the testicle as to delicacy of adhesions are so totally different that I do not in the least fear any suc result. It is, however, a point for careful consideration an watching, and it is certainly one that should impress upon al who try this method the need of carrying it out with strict asepti details.

The skin and tunica vaginalis being carefully sutured with fin carbolised silk, horsehair, or chromic gut, and the remaining tunica vaginalis lightly wiped over with a stick of silver nitrate or, if it is preferred, pure carbolic acid, all bleeding carefully arrested, it only remains to dust a little iodoform over the wound, dry this out most scrupulously, and to apply the dressings. Whatever material is used care must be taken that the dressings must supply the following conditions—viz., they must be aseptic, duly compressive, and unirritating. M. Juillard thinks these ends are best met by green protective over the wound and a layer of sponges wrung out of dilute carbolic acid next, and then gauze dressings. The sponges are largely recommended because their pressure is painless, being elastic. I have been in the habit of using green protective and iodoform gauze, secured in place by firm and even bandaging with a double spica. While this is applied, care must be taken that the scrotum is kept well up out of the pubes. This is a cardinal point, and must be attended to not only now, but later on, at and after each dressing. It prevents œdema, bagging, inflammation, and thus pain, and hastens rapid repair of the wound. When the dressings are *in situ*, a pad of carbolised tow should be kept over the anus, to prevent flatus or fæces contaminating the closely adjacent wound. The changing of the dressings must depend on the restlessness of the patient, his ability to put up with irksomeness and discomfort, any action of the bowels, the condition of the temperature, &c. On the third or fourth day most of the sutures uniting the skin and tunica vaginalis should be cut and removed; by the fifth or seventh day the patient may get on to a sofa, and by a date varying from the tenth to the eighteenth day he may usually begin to get about, with a suspender, and the small remaining wound protected by a sealed dressing (some sal-alembroth or iodoform gauze sealed on with collodion) changed every few days, or by one of iodoform or resin ointment. As the repair with antiseptic wounds is rapid, but often filamentary and weakly, I advise the use of a suspender for six months or a year after the operation, and longer if occasions arise for hard exercise such as riding, &c.

The possible *complications* of after-treatment of a hydrocele by the antiseptic method, will readily be gathered from the above account. They may be enumerated again here:—

(1) *Erythema* and *cellulitis*, from use of too strong and irritating antiseptics. (2) Scrotal *suppuration* from burrowing of discharge between the cut edges of the tunica vaginalis and the skin. This is due to bleeding vessels not having been perfectly closed, to imper-

fect suturing of the cut edges of the skin and the resected serous membrane, or from tying these sutures too tightly. This last want of precaution may lead to (3) *local sloughing* at different points along the edges of the wound. (4) *Hæmorrhage*.—This in a part so well supplied with blood may easily be set up by incomplete arrest of bleeding, or after the application of the curette or sharp spoon to a much altered inner surface of the serous sac. (5) Owing to incomplete closure and obliteration of the cavity left by the wound, a sinus may persist for three or four months, discharging more or less freely. I imagine this will be more likely when the tunica vaginalis is thickened and inelastic, or when the reparative powers of the patient are very poor. Wherever this most troublesome result seems to be impending, it is to be met by scraping out the sinus well after dilating it with a tent, or slitting it up. Cocaine may be used. (6) During the first few days *the use of a soft catheter* may be needed, owing to retention.

Antiseptic Drainage.—The following modification of the above method may be justifiably tried in a very few cases—*e.g.*, where a hydrocele has recurred after injection of iodine, or carbolic acid; but the patient objects to the idea of an incision, or is not fitted for the anæsthetic. The hydrocele being tapped with a medium sized trocar (made carefully aseptic by boiling) before the sac is completely evacuated, a fine piece of drainage tube is slipped in through the cannula before this is withdrawn. Flowing of the remainder of the fluid through the tube, not cut too short, will show that this is duly *in situ*. Antiseptic dressings are then applied, and every few days the tube is shortened. Dr. Atherton, of Toronto (*Lancet*, 1885, vol. ii. p. 1125), found in three cases treated in this way that in six to nine days the cavity had contracted to such an extent that no further introduction of the tube was possible. The cases were successful, but the report is not carried beyond the first fortnight. I have had no experience of this method in hydrocele, but judging from its success in several cases of pre-patellar and olecranon bursæ with obstinate serous effusion, I should be disposed to resort to it in such cases as those given above. The influence of the firm pressure which is also used in obliterating the above serous cavities must not be lost light of here.

Choice of Operation.—It will be gathered from what I have already said that, as I believe that it gives a better chance of radical cure than any other, I am in favour of the method by antiseptic incision and partial excision in the following cases—viz., (1) in all simple cases where the patient is willing to lie up; (2) those special cases which I have mentioned at p. 151; (3) cases in which injection has failed; (4) all cases in young adults with an active life before them, where the patient is healthy and amenable to directions, where the future life is likely to bring about a recurrence if the sac be merely injected. It must be understood that in every case the surgeon must have full reason to feel confidence in his ability to carry out antiseptic details. On the other hand, where the sac has thin walls, and where there is no reason to believe that alterations or any conditions likely to keep up irritation exist in the tunica vaginalis, where the patient is over fifty, or not a good subject even for the mild calls upon his reparative powers demanded by the antiseptic method, where he is unwilling to submit to the period, short though it is, of absolute rest which this method requires, where the surgeon feels that he is better fitted for simpler methods, then I should advise the simpler use of an irritant. Of these I believe silver nitrate to be the most certain, but liable to cause more orchitis and pain. Carbolic acid, on the other hand, has the advantage of being the gentlest. It has been shown that the entire freedom from complications which has been so loudly claimed for this method by some of its supporters is not entirely borne out by facts; as to its supposed greater efficiency, sufficient details are not yet to hand as to the permanent results of the earlier cases.

The Condition of the Tunica Vaginalis after attempts at Radical cure of Hydroceles, and the amount of Inflammation needful to secure this end.—The condition of the above serous membrane after the use of irritants varies much. While complete obliteration is certainly desirable when the rebelliousness of some hydroceles and the case of Sir A. Cooper, in which recurrence took place after twenty-five years, are remembered, it is by no means essential for success. A sufficient change in the minute anatomy of the serous membrane may occur to render the cure permanent, without any adhesions being present. M. Hutin has published (*Arch. Gén. de Méd.*, 5th sér. t. ii. p. 218) the results of iodine injection (two-thirds of water and one-third of tincture of iodine) in 16 cases in which he had the opportunity of making a post-mortem examination, all of these cases having been cured. In 8 only was there complete obliteration of the sac, in 4 there was partial obliteration, and in the remaining 4 no adhesions at all.* In 4 treated with wine injection there was complete obliteration. Apart from the varying susceptibility to inflammation in different subjects, it is probably the strength of the injection, the amount left in, and the complete evacuation of the hydrocele fluid which have most to do with a successful result. Next to these, probably, come changes in the tunica vaginalis itself.

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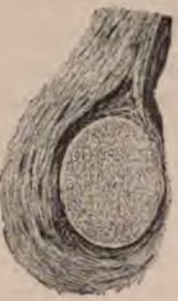
* The difficulty of following up cases is notorious. I have recently (Aug. 1892), had the opportunity of examining a case injected with iodine (Edinb. tinct.)

FIG. 23.



Complete obliteration of sac of tunica vaginalis, after injection with tincture of iodine. (Moullin.)

As to the condition of things left behind by the antiseptic method, we have, I believe, no certain information to go upon. The particular method adopted at the time of operation will have, of course, an important influence. Thus, it has been seen that M. Juillard leaves enough of the tunica vaginalis to suture the edges together, but keeps the surfaces in exact apposition afterwards, so as to secure their adhesion and the obliteration of any cavity. Others, and I am amongst them, follow Bergman, and remove the parietal layer completely, leaving the testicle itself and its visceral layer in contact with the raw inner surface of the superficial scrotal coverings from which the parietal layer has been detached. How far the testicle recovers mobility must be a matter for future investigation.

It remains to mention the other methods which have been adopted for the radical cure of hydrocele. As this has practically resolved itself into the use of the three already given irritants and the antiseptic method, all others will be alluded to very briefly.

Seton.—This method, strongly recommended by M. Chassaguac, has long been given up in France and elsewhere. Its use should be limited to those very rare cases where, injection and drainage (p. 158), having failed, the patient refuses to submit to incision. A double silk ligature (previously thoroughly carbolized) should be carried with a mounted needle into the hydrocele cavity at its anterior and lower part (the position of the testicle being first determined), and then made to emerge at a point about 2 inches higher up; the ends are knotted, and the silk is withdrawn in two to four hours, according to the amount of inflammatory swelling.

The *objections* to the seton are mainly two, and both serious.

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twelve years ago. There has never been any recurrence; the scrotal tunics are absolutely unthickened, and the mobility of the testicle is perfect.

(*a*) It is very liable to produce a high degree of inflammation, requiring incision. (*β*) If the patient escape the risks of suppuration the side of the scrotum is liable to remain long the site of indolent, semi-solid œdema. Its employment in small hydroceles —*e.g.*, of the cord—will be referred to later. It is permissible, though inferior to antiseptic incision and removal of the sac, in those cases of small hydrocele which are difficult to fix before puncturing, owing to their tendency to slip away before the fingers or point of the trocar.

Mr. Hussey (*St. Barth. Hosp. Reports*, vol. xiv. p. 81) records several cases thus treated. Seven out of ten were successful, but at the risk of severe constitutional disturbance. Suppuration was not infrequent, and sloughing of the scrotum took place occasionally. No antiseptic precautions were taken, but the patients were healthy countrymen in the Radcliffe Infirmary at Oxford.

Catgut* and carbolized silk have been used of late years, but are not reliable, and from the difficulty of maintaining asepsis are not free from the risks above given. Dr. O. Will (*Edin. Med. Journ.*, Dec. 1881) gives two cases of ordinary vaginal hydrocele thus treated. In one, recurrence having taken place after iodine injection, a catgut drain was inserted under the spray, and, although putrefaction took place, recovery followed. In the other case, the patient, aged seventy-five, had been tapped five times. On account of his age and infirmity iodine was not used, as it is apt to be followed by untoward results in the aged. The hydrocele, therefore, having been tapped under the spray, a sharp-pointed probe, armed with nine threads of catgut, was passed in at the lower part of the scrotum and brought out close to the external abdominal ring. The ends of the gut were then tied together and antiseptic dressings applied. No inflammation, no pain, no rise of temperature followed. In ten days the ends of the drain dropped off, and three days later the small granulating wounds were healed. A month later a certain degree of fulness was perceptible in the sac, and four months later the hydrocele was more distended than ever. It was perfectly translucent, showed no evidence of the use of the drain, and gave vent to amber-coloured fluid when tapped. The recurrence was considered to be due to the smallness of the openings made, and to the entire absence of inflammation. The catgut within the sac had been entirely absorbed.

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* Volkmann of Halle and Trendelenberg of Rostock advocated the use of drainage tubes in the same way. Another method is given at p. 158. Drainage tubes, if the case runs an antiseptic course (and on this, of course, the treatment depends) are not likely to be more efficient than catgut.

In another case Dr. Will used an iodised seton as follows: A sharp-pointed probe, threaded with silk, having been passed through the hydrocele as in the preceding case, the fluid was allowed to drain away by the side of the seton. An inch of this was then moistened with iodine liniment, and the upper end being then drawn upon the iodised portion was brought into the sac. A little gentle friction spread the iodine over the surface of the tunica vaginalis. The same process was repeated by the patient at intervals of an hour, and when, after the eighth application, a sharp pain was felt, the thread was altogether withdrawn. Slight swelling followed, and a radical cure resulted.

If for any reason it is decided to make use of the seton, the patient must be kept quiet and watched at frequent intervals—*e.g.*, two or three times a day—so that the right time for withdrawing or renewing the seton may be promptly seized, and that any threatening suppuration may be promptly treated and not allowed to extend to the scrotal tunics. It should never be employed in out-patients, nor in the aged, or those run down in health.

Of the **other means**, such as injection of ergotine, iron perchloride, zinc sulphate or chloride, mercury perchloride, the insufflation of iodoform, electro-puncture, it need only be said that there is nothing whatever to justify a preference of any of these over the ones already given. They have not the advantages of being simpler, or more efficacious, and while they are quite as likely to cause complications, they are far more uncertain as to success.

SECTION III.

CONGENITAL HYDROCELE.

This is a rare * affection often confused with the infantile variety. A communication exists here between the peritonæal cavity and that of the tunica vaginalis. It varies from the size of a goose-quill to that of a thread, and may be direct and free, or valve-like or tortuous. It may be imperfectly obliterated by adhesion, or imperfectly closed by an undescended testis. It is more likely to be met with in weakly children, and in those born prematurely. Very rarely this form of hydrocele, dating to a congenital lesion, does not make its appearance until a period far remote from infancy. In some cases this may be due to retention of the testis, and in two ways. (1) The retention is temporary, and when a late descent takes place, a congenital hydrocele may appear through the unobliterated process of peritonæum.* (2) The retention is permanent, and while the testis above prevents any descent of hernia, it allows of the formation of a hydrocele, which communicates with the peritonæal cavity.

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* Prof. Roser (*Arch. f. Phys. Heilk.*, 1858) in speaking of the causes of hernia, and amongst them of the above communication, refers to the statement of Camper, that of 63 children born at full time and with testes descended, the vaginal canal was only obliterated in 7: it remained open on both sides in 34, on the right side alone in 14; and on the left side in 8. So, too, Prof. Engel (*Wien. Woch.*, 1858) states that in children at birth, or during the first fourteen days afterwards, the vaginal canal is oftener obliterated, or at least much shorter

In other very rare cases, the presence of an increasing vaginal hydrocele, the testicle being in its proper place, may cause an opening up of an unobliterated vaginal process, but in these cases this is usually prevented by a closure having taken place near the external abdominal ring.

The source of the fluid in congenital hydroceles has been much discussed. Thus, two views have long been held as to whether it comes down from the peritonæal cavity, or whether it is formed *in situ*. *The* former or *peritonæal origin* is supported (*a*) by the existence of an open funiculo-vaginal process already alluded to; (*b*) by the hydrocele becoming distinctly larger from gravitation downwards of the fluid in patients who have been up and about; (*c*) by the fact that after obliteration of the communication by a truss, absorption of the fluid may take place spontaneously. I think the frequency of this has been over-estimated, and this argu-

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on the left side than on the right—a fact agreeing with the preponderance of hernia on the right side. He found the canal entirely closed at birth in 10 per cent. After fourteen days no trace of it could be found on the left side in 30 per cent., while it remained open on both sides at the end of fourteen days in 60 per cent. In the adult, the presence or the remains of the canal were observed in 31 per cent. of the bodies examined. French writers have described congenital hydrocele as met with far more frequently in France than in this country. Thus, M. Richards (*Gaz. des Hôp.*, 1857, No. 41) speaks of having met with 12 cases in a month at the Hôpital des Infants. Kocher (*loc. supra cit.*), from statistics which he quotes, gives the relative frequency of congenital hydrocele at about 4 per cent. Wechselsmann (*Langenbeck's Arch.*, 1887, Bd. xxxvi. S. 626) states that he found 37 hydroceles at the time of birth in 270 boys born during four months in the Clinic of Dresden, 31 being on the right side, 2 on the left, and 4 bilateral. In size they varied from that of a cherry to a plum, or larger. Of these hydroceles 14 communicated, and 23 were closed and non-communicating. Clinical observation and not *post-mortem* examination was the only test employed here.

* Mr. Curling (*loc. supra cit.*, p. 156) once met with an instance in a lad aged eighteen.

ment, accordingly, over-rated. This is supported by what we meet with in infantile hydrocele, which, owing to the obliteration at one spot of the funiculo-vaginal process, presents an analogous condition to the congenital form in which an obliteration has been brought about by truss-pressure. Here, from my experience of 37 cases, we rarely obtain absorption of the fluid spontaneously, acupuncture being almost invariably required. This argument is supported by what we know of the much rarer bilocular hydroceles. (*d*) By the fact that occasionally, though very rarely, ascites co-exists with congenital hydrocele. M. Faure (*Gaz. des Hôpitaux*, 1889, No. 93, p. 845) gives the additional reasons for believing that the origin of the fluid is peritonæal: (*a*) The appearance of the hydrocele often, he thinks, co-exists with a failure in the health of the child, which would not be explained if the tunica vaginalis were alone affected, but which is more probably due to some grave lesion—viz., a pathological condition of the peritonæum. (*b*) There is the abundance of the fluid secreted. M. Faure thinks the amount is proved to be considerable by the fact that when the patient lies down the fluid disappears, and when he stands up the fluid again descends into the scrotum. This can only be brought about, he holds, by the fluid in the abdomen rising to the level of the inguinal canal, which would necessitate its first filling up the pelvis and lower part of the abdomen to the level of the internal ring. The first of these reasons is a mere hypothesis, supported, I think, neither by clinical observation nor *post-mortem* experience. The second is weakened by the fact that in the healthy abdomen the parts are so closely packed together that no cavity, pelvic or abdominal, exists. The other view, that *the fluid is formed in situ*—is supported (*a*) by the fact that congenital hydrocele occasionally does not occur till some time after birth. Thus, I have operated on two boys, aged three years and eight years respectively, in whom, at the operation for radical cure by incision and excision of the sac, a communication was found by which a probe could be passed into the peritonæal cavity. Yet in each case the swelling had only been noticed a few months. This is not in accordance with a peritonæal origin. (*b*) By the fact that the peritonæal fluid is extremely small in amount, in existence really a moisture rather than an actual fluid. (*c*) By the extreme delicacy of the funiculo-vaginal serous membrane at this tender age. It can be readily understood that in such a membrane, the constant restlessness of a little child, so habitual at this age, may easily cause sufficient irritation to bring about effusion of fluid. And I do not think that the admission of this view in infants with such a delicate condition of the faulty serous membrane at this age, at all weakens the view that I have held (p. 105), that in later life, and with a different condition of the parts, vaginal hydrocele does not usually originate in a vaginalitis.

I am of opinion that the fluid of congenital hydroceles may originate in both ways, most frequently, I think, below and *in situ*, from slight and frequent irritation of a very delicate serous membrane. In other cases, as in the one given below, it descends from above. This is more likely to be the case where the peritonæum or some of its contained viscera are diseased. M. Verneuil (*Rev. de Chir.*, 1891, p. 1019) gives the following case as proving, incontestably, the peritonæal origin of the fluid. The existence of a retained testicle which prevented the obliteration, and the disease of the liver which led to the ascites, prevent this case from having any bearing on the causation of the ordinary form of congenital hydrocele. The patient, aged thirty-five, with retention of the right testicle, had had syphilis. For some time his health had been deteriorating. After a strain he noticed a large swelling in the right side of the scrotum, which was easily reducible. He was found to have a congenital hydrocele, and his abdomen considerably distended with fluid, the result of hepatic cirrhosis due to alcohol or syphilis. The causation was as follows: Retention of the testicle with a pre-formed funiculo-vaginal sac, cirrhosis supervening with ascites; finally, in consequence of a strain, the ascites directs some of its fluid into the sac. M. Bazy met with a similar case in which a patient suffering from cirrhosis with ascites, had a secondary hydrocele. M. Phocas (*ibidem*, p. 415) had noticed three cases in which congenital hydrocele was accompanied by ascites, and in one case he had been able, in the course of an operation, to satisfy himself of the peritonæal origin of the fluid. In two of the cases the fluid was tubercular in character, as shown by inoculation and the microscope. M. Phocas goes so far as to say that congenital hydrocele is sometimes the first sign of a tuberculous peritonitis.

Symptoms.—Congenital hydrocele is usually noticed soon after birth. In addition to the other signs of hydrocele—viz., smoothness, fluctuation, thrill and transparency (many of these difficult to verify in the very small parts of an infant), it is distinctly pyriform, with a narrowing prolongation along the cord, and receives an impulse more or less distinctly on the child's coughing or struggling.* By careful steady pressure, the fluid may be returned into the abdomen, but it returns gradually and imperceptibly, although the finger be kept over the external abdominal ring. This takes place more readily if the patient is in the erect position. The cases in which especial difficulty will be met with are those in which the communication is extremely minute, valve-like and tortuous, those in which attempts at obliteration have taken place, or a retained testicle is present. In such cases the fluid can only be returned and an alteration produced in the size of the swelling by steady, continued pressure, kept up, perhaps, for half an hour. As it is always difficult, owing to the small parts and the struggles of the child, which bring its muscles into action, to verify the existence of a communication, it will be well to give an anæsthetic in these cases. Where the communication is free, there will be impulse on coughing or when the child cries, and the return of the fluid will take place rapidly, and diminution in size after the patient has been recumbent will be more easily perceived.

Diagnosis.—Congenital hernia is the swelling most likely to be confused with this hydrocele. Both are noticed soon after birth; both are continued upwards into the inguinal canal, and receive an impulse† on coughing, &c.; both are reducible, especially when in the hydrocele the communication is a free one, though in a different way. By keeping the points in the following table in view, the diagnosis will be facilitated:

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* In the following interesting specimen of congenital hydrocele, shown by Mr. John Poland at the Pathological Society (*Lancet*, 1884, vol. ii. p. 1001), this evidence appears to have been wanting. The case is a good instance of a very early condition—viz., partial closure of the peritonæum at the internal ring. The child, aged three-and-a-half years, had had since birth a swelling in the left side of the scrotum, which had gradually increased in size. It was said never to have disappeared or diminished at any time, and crying caused no increase of its size. The patient was admitted into the North Eastern Hospital for Children in 1881, with acute peritonitis following the tapping of the hydrocele three days before. The signs of acute suppurative peritonitis were seen at the autopsy. The peritonæal cavity was full of pus, and the sac of the hydrocele below communicated freely with this. The wall of the sac was much thickened, its inner surface shaggy with purulent lymph, and its cavity contained sero-pus like that in the abdomen. The tunica vaginalis at the lower part of the sac was intimately blended with it, but its smooth and glistening lining showed no traces of inflammation. The sac of the hydrocele when traced upwards along the canal became somewhat narrowed at the internal ring, and then communicated with the peritonæum by a finger-like process. The cord was closely connected with its posterior wall.

Kocher (*loc. supra cit.*) records a case in which the swelling disappeared during the night, and only regained its full size after the patient had been up and about three hours. MM. Monod and Terrillon advise, in doubtful cases, to compare the size of the swelling before the patient gets up with that after a long walk, or as the day closes.

† Mr. Curling (*loc. supra cit.*, p. 157) met with a case of a congenital hydrocele

Congenital Hydrocele.	*Congenital Hernia.*
1. Is dull on percussion.	1. Is, usually, resonant on percussion.
2. Requires even steady pressure; goes back gradually, and without any slip, jerk, or gurgle.	2. Requires less pressure; goes back quickly, often with a sudden slip or jerk and with a gurgling sound.
3. Redescends steadily but imperceptibly, though finger-pressure be kept up on the external abdominal ring.	3. Does not redescend if finger-pressure be kept up on the external abdominal ring.
4. Feels soft and even; no irregularity; gives no gurgling when manipulated.	4. May be soft and even, or may be irregular; often gurgles on manipulation.
5. Is distinctly translucent.	5. Is usually opaque, but may show a certain amount of translucency (p. 118).

Complications.—These are mainly two—(1) **Hernia** and (2) **Suppuration.**

(1) **Hernia.**—This is usually rare, owing to the small aperture of the communication. (2) **Suppuration.**—This is a grave complication, owing to the danger of fatal peritonitis. It is especially liable to occur in infants after erysipelas, owing to the tendency to fugacious spreading, often noticed here. I have met with two instances in infants of ten days and five weeks respectively, in one of which the erysipelas started from the remnant of the umbilical cord; in the other, from an intertrigo about the genitals. In both the erysipelas, as it travelled over the abdomen, found an unobliterated processus funicularis, and caused a fatal suppurative peritonitis. The thinness of the abdominal wall at this age is well known.*

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in a boy, aged three, in which there was no impulse on coughing, and in which it required long continued pressure to effect any return of the fluid. Both these points were, he thought, explained by the aperture of communication being, probably, scarcely as large as a pin hole.

* My old friend Dr. H. P. Berry, of Grantham, reports (*Lancet*, 1883, p. 863) a case in which a child nine days old died with suppuration of a double congenital

Later on in life it is quite possible that a persistent congenital hydrocele may aid in bringing about a fatal peritonitis, lit up by disease of the testicle. Thus J. Cloquet examined the body of a man, aged fifty, affected with congenital hernia, whose abdominal and thoracic viscera were perfectly sound; but the peritonæal cavity contained six pints of yellow serum mixed with flocculent albumen, which appeared to have originated in disease of the testicle and the extension of inflammation from the open tunica vaginalis to the peritonæum.

Treatment.—This is—(A) **Palliative**; (B) **Operative.** In a large number of cases met with in infancy and childhood, the pressure of a truss, aided after a time by acupuncture, well applied to the inguinal region, will suffice, owing to the natural tendency to cure at this time of life. This pressure, if begun early and carefully persevered with, will produce obliteration of the neck of the sac in nearly every case. If the annoyance caused by the watching, &c., necessitated by the constant wearing of a truss in a a young child, is objected to by the friends, the surgeon must insist on the necessity of this. It is of the utmost importance to secure firm obliteration of the communication in these cases early, for two reasons. In the first place, there is the risk of a hernia forming also, while another source of danger from an unobliterated communication, is the facility with which inflammation spreading from below may reach the peritonæal cavity (p. 167). Where truss-pressure and acupuncture have proved a failure, or where a truss is not persevered with, the question of more radical treatment will arise. While experience has shown that the injection of these hydroceles with iodine may be safely undertaken nowadays if a well-fitting truss is worn for a few days beforehand, and during the operation, this method is distinctly inferior to that of aseptic incision, for the reasons given below. If iodine or carbolic acid injection is made use of, the surgeon must insist on a truss being worn for a few days before and after, as well as during, the operation. From half a drachm to a drachm of iodine tincture (p. 142) will be sufficient for the injection, and for fear of the inflammation running too high, all the fluid that is injected should be withdrawn. If injection is to be used, half a drachm of carbolic acid (p. 148) would be preferable to iodine, owing to its more localised action.

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hydrocele. It is suggested that in somewhat analogous instances where the mischief, as in this case, seems limited to the scrotum, and where no *post-mortem* examination is made, death may have been attributed to erysipelas or some more or less superficial inflammation.

The treatment by antiseptic incision is much to be preferred, not only because it is safer, but because it admits of, at the same time, dealing with any hernia present. It is quite true that it involves the trouble of subsequent dressings, and that in young children the small parts do not readily lend themselves to operation, while in young infants antiseptic details are not readily maintained. But in very early life this method of incision will very rarely be called for. The parts being cleansed, and shaved if needful, an incision is made over the lower part of the inguinal canal and the upper part of the scrotum, and the canal opened as in an operation for hernia. The funiculo-vaginal process is next identified,* great care being taken in separating it from the cord. The serous process is then divided just above the testicle;† then, having been separated from the adjacent parts as high as the internal ring, it is secured by a double ligature of carbolized silk, or by torsion, and cut away. To enable the operator to get at the internal ring without making a needless incision, the upper part of the wound should be well retracted.

A drain of horsehair being inserted into the whole length of the wound, this is next closed with fishing-gut and horsehair sutures. If there is any reason to think that a hernia is present the prolongation of the peritonæum upwards must be carefully emptied before it is tied and emptied. The testis must be as little disturbed as possible, and where this has been unavoidable the scrotum should be invaginated and the lower end of the testis sutured here by a chromic-gut stitch, cut short and buried (p. 87).

SECTION IV.

INFANTILE HYDROCELE.

This is a very common affection, especially among the children of the poor. In it the tunica vaginalis and, to a varying extent, the funicular process are distended with fluid, but this is shut off from the peritonæal cavity by a partial obliteration of the serous surfaces, situated usually near the external abdominal ring. It depends on the fact that obliteration of the serous surfaces has taken place above only, instead of above and below, close to the testis, simultaneously. The fluid is formed below from over-secretion of the now more vascular and easily irritated serous membrane.

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* In some cases, from difficulty in defining delicate structures exactly, or where a hernia is present, the funiculo-vaginal sac is opened. If this be done, to ensure identification during subsequent manipulation, Spencer Wells' forceps should be at once placed on the cut edges of the sac.

† The cut edges here may be united with fine chromic gut, so as to form a new tunica vaginalis, but there is no necessity to take this precaution.

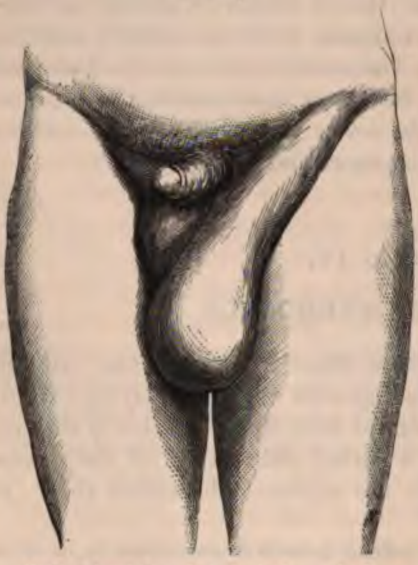
Symptoms and **Diagnosis.**

Infantile hydrocele is readily recognised by its early appearance, its smoothness, fluctuation, thrill, and marked transparency. It is distinguished from the congenital variety by the fact that steady even pressure has no effect upon it, and that it shows much less diminution in size after the patient has been recumbent. From hernia it is known by its transparency (p. 118), the impossibility of reduction, and the absence of any gurgling when the swelling is manipulated.

Treatment.

Infantile hydrocele in a healthy child may disappear spontaneously. This may be aided by the use of a lotion containing vinegar and water, spirit, lead, or ammonia hydrochlorate (gr. x; aq. ℥j). Attention should also be paid to the health of the child and mother, if the latter is still suckling. But, as a rule, especially in poor patients, acupuncture should be resorted to early. It is absolutely safe and far more speedy. The swelling being made tense, half a dozen punctures are made into the front and lower aspects of the swelling with an ordinary surgical needle, which should be slightly rotated before it is withdrawn. This should be scrupulously clean, and dipped in carbolic oil. Jets of fluid follow at each puncture, a good deal of oozing follows, and some of the fluid escapes into the cellular tissue of the scrotum, whence it is absorbed. Lead lotion should be applied afterwards, and the part kept up as much as possible. Usually the

FIG. 24.



Hydrocele of the whole funiculo-vaginal process of peritonæum. (Osborn.

punctures will have to be repeated two or three times. In 37 cases I have never known this fail. If it should do so, a radical cure may be brought about by passing a fine seton of carbolised silk or one soaked in iodine through the sac, and leaving this in for an hour or so, or by the antiseptic incision (p. 154). But if acupuncture be properly tried, no other treatment will be needed in infants.

Occasionally the tunica vaginalis and the funicular portion of the cord remain in communication even in adult life, though shut off above from the general peritonæal cavity. This variety will be described next and separately.

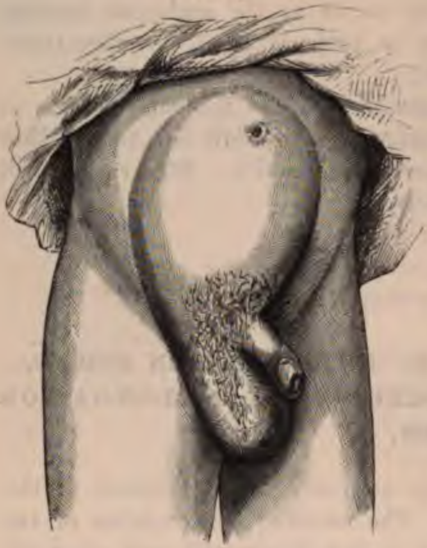
SECTION V.

BILOCULAR HYDROCELE.—HYDROCELE EN BISSAC.—INFANTILE HYDROCELE WITH PROLONGATION INTO THE ABDOMEN.

Infantile hydrocele leads up naturally to a description of this rare but interesting variety. The swelling here consists of two pouches, communicating more or less freely with each other, the one below and scrotal, the other above in the inguinal region, and occupying sometimes the lower part of the abdominal cavity and the iliac fossa.

Pathology.—The origin of this form of hydrocele probably depends, as pointed out by Malgaigne, on a faulty obliteration of the funiculo-vaginal process of peritonæum. Instead of as in normal course, when the obliteration takes place above at the internal ring and below above the testicle; instead of as in infantile hydrocele, when the obliteration takes place above and the funicular portion of the process is usually closed as far as the external abdominal ring, in the bilocular hydrocele the funiculo-vaginal process is only obliterated at a point very high up, probably at the internal ring. All below remains open, and fluid, gradually accumulating, ascends in the canal, the upper or the lower part of the swelling proving the larger according to the resistance met with by the serous membrane from the parts around. The constricting point corresponds in some cases to the external abdominal ring, in others to the narrow opening of communication between the two sacs. Another view, held by Dupuytren, that bilocular hydrocele is merely an ordinary vaginal hydrocele which, from extreme distention, has pushed its way upwards along the cord into the canal, is thought by Kocher to hold good for some cases. But, as pointed out by Duplay, there is this objection to Dupuytren's view, that we often see cases of hydrocele with extreme distension, but without any tendency of the fluid to pass beyond the ordinary limits of the serous membrane.

FIG. 25.



Bilocular hydrocele ; hydrocele en Bissac. (Bazy.)

The relations of the hydrocele to the peritonæum are obviously of great importance. This point has not been clearly detailed by many of the writers on this subject. M. Bazy, who has given a very full account of a colossal specimen of bilocular hydrocele on which he operated with entire success, believes that as the abdominal or upper of the two sacs presses its way backwards, it also goes downwards, following the constituents of the cord into the iliac fossa, out of which it raises the peritonæum, pushing this against the parietal layer of the abdominal wall. If this view were correct, an incision through the abdominal wall could only reach the upper sac after going through two layers of the peritonæum. Tillmanns, however (*Arch. f. Klin. Chir.*, 1881, Bd. xxvi. S. 1009), states expressly that in his case the swelling was developed between the abdominal wall and the peritonæum, with very close adhesions to the latter, but easily separated from the layers of the former.

The swelling is usually spherical, occasionally sausage-shaped. The size of the two sacs varies much. Thus, both may be enormous. In other cases, as in that of M. Bazy, while the lower is that of a large ordinary hydrocele, the upper may reach above the umbilicus[*] and across to the opposite side of the linea alba.

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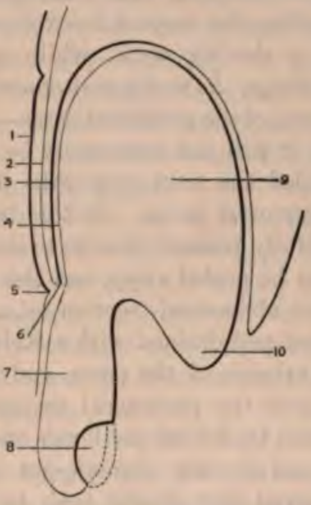
[*] A very similar upward extension is recorded in a case by Lammert (*Centr. f. Chir.*, 1889, S. 646). Tapping was successfully followed by incision. Eighteen cases of Hydrocele en bissac will be found collected by M. Villeneuve (*Mercredi Médical*, 6 Août, 1890).

Or as in one of Kocher's cases, the abdominal pouch may be only the size of a nut. This form of hydrocele is usually unilateral.

Symptoms and **Diagnosis.**—To begin with, the nature of the scrotal sac will be recognised by its presenting most of the symptoms of ordinary hydrocele. The next point will be to make out the existence of any communication between this and the upper sac. The existence of any thrill on percussion, any tension of the one sac when pressure is made on the other, the presence of fluctuation above and below Poupart's ligament, should be examined into. In children, as advised by Kocher, the use of an anæsthetic may be helpful in making out the nature of the upper swelling, by allowing of a rectal examination, as in Kocher's two cases of boys of thirteen (*Centr. f. Chir.* 1878).

FIG. 26.



This represents (diagrammatically) the antero-posterior section of M. Bazy's case of bilocular hydrocele, showing its relations to the surrounding structures, especially the peritonæum, as they were believed to exist. 1, Abdominal wall. 2, Parietal peritonæum. 3, Peritonæum lining the iliac fossa, and pushed upwards by the swelling. 4, Wall of hydrocele. 5, Poupart's ligament. 6, Cul-de-sac of peritonæum. 7, Scrotal portion of hydrocele. 8, Testicle. 9, Abdominal portion of hydrocele. 10, Portion of hydrocele which dipped into the pelvis. (Bazy.)

Course and **Prognosis.**—As it would appear probable that this hydrocele is liable, but to a much greater degree, to the same dangers as may complicate a vaginal hydrocele, especially hæmorrhage and inflammation, treatment should be resorted to early.

Treatment.—While the different methods applicable to ordinary hydrocele—viz., puncture, injection, and incision, have all been used successfully in bilocular hydrocele, the last of them is the most generally applicable, and the one to be recommended. Simple tapping,* while uncertain, may be used once or twice in very extensive cases, so as to reduce their size before proceeding further. Injection with iodine is not to be relied on here, especially in cases where the scrotal sac is of large size, or where the aperture of communication is evidently small and narrow. If injection be made use of it should be reserved for cases with thin and delicate walls, as in Kocher's two cases in boys. The method of free incision with antiseptic precaution has the advantage of enabling the surgeon to explore the whole sac, and see what parts he is dealing with, while it ensures an obliteration of both swellings. As to the peritonæum and the best way of dealing with it, several of the published cases—*e.g.*, that given below (p. 175), show that it will not necessarily be troublesome. If it has been clearly divided the next step will depend upon whether the cyst can be removed or no. If this be possible, after sponges have been carefully packed in so as to shut off the peritonæal cavity, the cyst must be peeled away, and the peritonæal wound treated as in any other abdominal section—*i.e.*, either closed entirely, or partly closed and drained with a Keith's tube, according to the amount of disturbance of the parts, and the probability of any fluids having entered the peritonæal cavity. In removing the sacs sufficient should be left of the lower one to fashion a tunica vaginalis with the aid of a few chromic-gut sutures. Where the sacs cannot be removed they should both be freely opened, the superfluous part cut away, and the cut edges sutured to the edge of the wound, the peritonæum being included in the sutures in cases where this has been wounded. A sufficiently free incision with strict antiseptic precautions, keeping the field of the operation as extra-peritonæal as possible, and adequate drainage, are the chief points in the operation. The method by incision has one disadvantage which must not be lost sight of afterwards, and that is, possible weakening of the abdominal wall. If, however, the patient has to wear a truss this disadvantage is more than made up for by the greater safety and sureness of incision as a means of radical cure.

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* M. J. Schmidt records a case (*Centr. f. Chir.*, 1889, S. 94) in which the scrotal part of the swelling was as large as a child's head. The patient was thirty. After tapping and withdrawal of about four pints, the cyst was washed out with perchloride solution. This was repeated in seventeen days. Finally

The following case, under the care of Prof. Humphry, shows the success of a free incision in pre-antiseptic days, and also that the peritonæum is not always met with:

A man, aged thirty-five, had a large hydrocele at the right side, with a transverse constriction near the upper part. It extended up to the inguinal ring, and received an impulse when he coughed.

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there remained a hard, painless, scrotal swelling the size of a chestnut, and no longer communicating with the abdomen. The after-result is not given.

On examination of the abdomen a fluctuating swelling was found at its lower part, like a distended bladder, and a distinct impulse was communicated from this to the scrotal swelling, so that it was clear that there were two sacs, one in the scrotum, the other in the abdomen, communicating through the inguinal canal. The history was obscure. The patient was unconscious of any swelling in the abdomen, yet had worn a truss for supposed rupture. The scrotal swelling was attributed to a blow on the pommel of a saddle ten years before. It had gradually increased. A trocar passed into the scrotum gave vent to seven pints of serous fluid, emptying both sacs. The testicle lay at the inner and upper part of the scrotum. Pain and swelling of the left lower limb, with other indications of inflammation and plugging of the femoral vein, followed. These subsided, and the fluid was on three subsequent occasions drawn off. A more radical proceeding being desired, an incision was made into the swelling and carried up to the internal ring, so that there might be a free vent for the products of inflammation from the abdominal sac; lint was then inserted. Suppuration ensued, and when the wound healed the cavity was obliterated in its whole length.

M. Bazy's interesting case (*Arch. Gen. de Méd.*, 1887, t. xx. p. 553) occurred in a patient aged twenty, who had noticed his scrotum enlarging for five years. The size of the swelling is shown in fig. 25, and its probable relations to the peritonæum at fig. 26. Palpation and percussion showed a distinct communication between the two sacs, and the scrotal one swelled up when the patient coughed. The hydrocele was clearly transparent. The testicle was in the position ordinarily met with in hydroceles. Rectal examination showed fluctuation, thus proving that the swelling had dipped into the true pelvis. An incision was made from a little above the external ring over the scrotal swelling, ordinary hydrocele fluid gushing out when the tunica vaginalis was opened. Through this incision M. Bazy was able to gradually pull down and detach the whole collapsed sac from its surroundings. The adhesions to the peritonæum were easily separated, but those to the cord gave some trouble. The lowest part of the sac was left as a new tunica vaginalis.*

The following case of bilocular, or as the author termed it, "abdominal hydrocele," is recorded by Prof. Syme (*Lancet*, August 16,

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* The dissection of a similar case in a man, aged thirty-five, who died of another cause, will be found given by Sir J. Lister, *Edin. Med. Journ.*, 1857, vol. ii. p. 236.

1861):—The history of sudden increase in the swelling, and the treatment adopted are of interest. A child between four and five was admitted with what seemed to be an incarcerated, if not a strangulated, hernia. It appeared that a rupture-bandage had been worn between two and three years, but that the scrotal swelling suddenly enlarged, with great distension of the abdomen, so as to present a very alarming appearance, though no corresponding symptoms of any consequence were present. The muscles being relaxed by chloroform, the abdominal swelling, though very large and tense, like a uterus at the full time, and extending high above the umbilicus, and to a proportionate extent on each side, still left a narrow space in which the intestines seemed to possess their natural laxity. On this ground, coupled with the absence of symptoms denoting strangulation, the diagnosis was made of hydrocele, not hernia. Lest this view should not be correct, instead of puncturing the scrotal swelling with a trocar, Prof. Syme made a small incision through several thickened layers, and evacuated a large quantity of serous fluid. Then introducing his finger, he found that the state of things was what had been suspected, though the abdominal part of the swelling remained unchanged. Prof. Syme accounted for this by the effect of the pressure of the bandages, and he proposed after a while to puncture through the parietes of the abdomen. But in two or three days the fluid began to drain away from the scrotal aperture, at first clear and then slightly turbid with lymph; the child at the same time being slightly feverish, while the swelling gradually diminished. The child returned home three weeks after admission, and when last heard of was quite well.

SECTION V.

FATTY, CHYLOUS, MILKY HYDROCELE.

By the above term* is meant a collection in the tunica vaginalis of fluid resembling fat or chyle.

Pathology and **Causation.**—The presence of a fluid resembling liquefied fat or chyle in the tunica vaginalis has now been noticed in a considerable number of cases, but it is, I think, clear that they cannot all be included in the same group, or explained by one and the same cause.

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* Of all the names given to this affection, viz., galactocele (Vidal de Cassis), lymphocele (Gubler), chylocele (Malgalhaës), fatty hydrocele (hydrocele graisseuse, M. Le Dentu) seems preferable to others, because as pointed out by MM. Monod and Terrillon, it does not prejudge, in any way, the question of origin of these hydroceles which has been so much disputed.

The following *theories* must at present be all considered:

(A) *The Parasitic Theory.*—This theory certainly holds good in these instances—a large proportion of cases of fatty hydroceles which have been recorded lately in patients who have lived in China, India, Egypt, Brazil, Australia, and some of the French colonies—*e.g.*, Réunion, and Antilles. The explanation of the character of the fluid in these hydroceles is the same as that for lymph-scrotum. It has been shown by Manson and others that a minute nematode worm, or filaria, may be introduced from the water of certain countries, either directly or indirectly, by the means of leeches which contain the filarial embryoes. The ova thus introduced pass through different stages of development, the adult form of the filaria having for its habitat the vascular or the lymphatic system. By causing obstruction at certain points lymph-scrotum, scrotal elephantiasis, or chyluria are brought about, and it is very probable indeed that fatty hydrocele originates in the same way.*

The fluid in fatty hydrocele has the physical characters of mingled chyle and lymph, and this is supported by chemical analysis. The fluid is distinctly and completely white as cow's milk, and becomes denser at the top while standing, the fat floating upwards and forming a layer which recalls cream.† When shaken up with ether the fluid becomes clear. The reaction is neutral.

In the following cases the presence of the filaria was demonstrated. The first is recorded by Dr. W. M. Martin (Mobile) (*Ann. of Surg.*, Nov. 1888):

The patient, aged twenty-two, white, born in Mobile, consulted Dr. C. H. Martin (senior) Sept. 27, 1887, for "an enlargement of the left testicle." He had never been out of Mobile and its immediate vicinity, and did not remember to have drank cistern or tank water, or any standing uncovered water. Eight years ago his right testicle passed up into the inguinal canal, where it has since lodged, which he attributes to horseback riding. The left testicle began to enlarge three years ago, without pain, and only caused inconvenience from its bulk.

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* A case has been recorded in which lymph-scrotum, elephantiasis and chyluria were all combined in the same individual. Lymph-scrotum and chylous hydrocele have also occurred together. The importance of this parasitic origin, the identity of lymph-scrotum and scrotal elephantiasis is again alluded to in Part III., DISEASES OF THE SCROTUM.

† These cases of hydroceles with milky fluid are not, of course, to be confounded with encysted hydroceles in which from the presence of spermatozoa the fluid is also, but incorrectly, called milky. In these latter cases, the tint is a turbid, opalescent one, like soap and water or cocoa-nut milk (Curling), not completely white like true milk. Furthermore, while the fluid of chylous hydroceles becomes denser above on standing, the reverse is the case with spermatoceles, owing to the subsidence by gravity of the spermatozoa (Cameron, *Lancet*, 1884, vol. i. p. 842).

The right testicle was atrophic, insensitive, and occupied a fixed position about the centre of the inguinal canal. The left testicle had the dimensions of a medium-sized pear, was pyriform in contour, and semi-translucent and painless. The glands in both inguinal spaces were moderately enlarged and in chains, each gland being easily outlined. The left tunica vaginalis was tapped, and 4½ ozs. of milky fluid withdrawn. The testicle was neither enlarged nor painful. The fluid was alkaline in reaction, albuminous and of a yellowish milky colour, and contained microscopically numerous fat granules, some leucocytes, and epithelial scales and embryonal entozoa in active motion. The sac refilled slowly and was retapped twice—viz., Nov. 7, 1887—when about 1½ oz. was removed and three slides examined, with the result of finding 14 embryo filaria, and March 19, 1888, when 1 oz. of fluid was withdrawn and five embryoes found in three slides. These were all active and vigorous, and remained alive until the liquid medium dried up. Repeated blood examinations were made, but always with negative results, although great care was observed in conducting them, and with due regard for filarial migration, and inversion of this periodicity.

In the next case, also, it will be seen that the filaria were present in the hydrocele fluid, but were not found in the blood, Dr. S. Davies (*Brit. Med. Journ.*, 1885, vol. i. p. 1245). A Greek, aged twenty-three, consulted Dr. Davies at Cairo for a hydrocele. When this was tapped, 2 ozs. of milky fluid were drawn off. This after standing separated into a thick and thin portion, and had the ordinary characters of chyle. Microscopically, the fluid contained fat granules, and leucocytes, and three or four embryonic filaria. The patient had had gonorrhœa three times; he had never suffered from chyluria or hæmaturia. The case was treated by incision, and about five months after there was no return. Examination by day and night of the blood revealed no filariæ.

In the above cases the escape of the lymph and chyle probably takes place by transudation after obstruction of the lymphatics by the collection of the ova of the filaria. The way in which the plugging of the lymphatics is brought about is probably identical with that considered by Dr. Manson to be the true pathology of elephantiasis, chyluria, lymph-scrotum, &c. The fully formed filaria, having about the same diameter as that of a lymph-cell, do not interfere with the lymph flow. The ova,* however, containing the immaturely developed embryo, far exceed that of the fully formed filaria, and, consequently, if the former escape into the lymphatics, plugging of the lymphatic glands follows, and stoppage and regurgitation of the lymph from an area of varying extent, according to the position of the parasite.

(B) *Traumatic Theory.*—Another much less well-authenticated means of escape of the same fluid takes place, perhaps, by rupture of a lymphatic, after a blow on the scrotum. The following case which came under the care of Dr. Milford, reported by Mr. Kendall of Sydney (*Brit. Med. Journ.*, 1885, vol. i. p. 738), is perhaps one of the kind: A man, aged twenty-six, had received eight years before a blow on the left testicle, which soon after began to swell. About two years before admission, the swelling was tapped and about a pint of milky fluid was drawn off. He was admitted into St. Vincent's Hospital, Sydney, June 4, 1884. The swelling was large, pyriform, opaque and doughy to the touch. It was tapped three times, a fortnight intervening between the first two tappings: on each occasion a considerable quantity of milky fluid was drawn off. The fluid on being shaken up with ether became ordinary hydrocele fluid. On being allowed to stand for the night, the fluids separated into a thick and thin portion, the thick substance floating at the top and looking like cream. The sp. gr. of the fluid was 1019. Microscopically it consisted of a series of oil globules floating in a colourless fluid. There was no evidence of spermatozoa being present. On the third occasion, about nine weeks after the second tapping, the hydrocele, being very full, was again tapped, and on this occasion ordinary hydrocele fluid mixed with blood was drawn off. The case is not carried beyond this date, and no suspicion of the existence of filaria seems to have occurred.† Mr. Kendall was inclined in this case to adopt the explanation of M. Vidal—that the milky fluid is simply ordinary hydrocele fluid, *plus* some of the fatty matters of the blood which have exuded through the capillaries of the tunica vaginalis owing to some pathological change.

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* Dr. Manson (*Filaria Sanguinis Hominis*, 1883, p. 71) states that the filaria measures $\frac{1}{90}$ inch in length by $\frac{1}{3500}$ inch in width. Dr. T. R. Lewis (Quain's *Dict. of Med.*, p. 513) says that the ova in which the embryoes were not yet distinctly visible measured $\frac{1}{1200}$ by $\frac{1}{2000}$ of an inch; and that the ova in which the embryoes were evident were $\frac{1}{600}$ by $\frac{1}{750}$ of an inch in size.

† It is right to add that filaria have been met with in Australia.

A better instance of perhaps traumatic origin is reported from Tokio (*Arch. Klin. Chir.*, 1885, Bd. xxxii. Hft. 1). Here the patient, aged twenty-eight, had received a contusion of the scrotum four years before. Five days later he had some pain in walking and scrotal swelling, the latter gradually coming to look like a large hydrocele. Whitish-yellow milky fluid, non-transparent, was drawn off, containing microscopically fat cells, but no filaria. Iodine was injected but the patient was lost sight of.

(C) Another explanation of chylous hydroceles has been put forward by Dr. W. M. Martin * (*Ann. of Anat. and Surg.*, May 1883; *Lond. Med. Rec.*, Dec. 15, 1883; *Ann. of Surg.*, Nov. 1888). He believes that cases may occur in which an *obstructive* gonorrhœal *lymphangitis* of one or more of the glands into which empty the lymphatics of the cord is set up, resulting in stasis, varicose dilatations, thinning, and final rupture, with leakage of lymph.

The subject of this case was a man, aged twenty-two, who, about four years before he came under the author's notice, observed that both testes were enlarged, and the seat of occasional erratic and dull pains. This enlargement increased slowly and gradually until the beginning of the last nine months, when, after an attack of gonorrhœa, it rapidly advanced. The patient, when first seen by Dr. Martin, had a gleety discharge, a contracted meatus, and a decided increase in the size of both testules. The right was as large as a man's fist, pyriform in shape, opaque to transmitted light, somewhat elastic, with slight fluctuation, and at its posterior and upper part, in the region of the cord, filled with irregular, tortuous, worm-like masses, resembling a varicocele. The tumour on the left side was much smaller and firmer, and was not transparent, but presented similar tortuous and corded masses. The swelling on the right side was punctured, and emptied of 3 oz. of milky fluid, the elements of which, on microscopical and chemical examination, were found to be plainly those of chyle. Examination of the right testicle proved that gland to be of normal size, but occupying its upper and back part, where joined by the cord, and along the course of the cord, were the same masses above referred to. Three months later, the fluid having accumulated, 1½ oz. of similar chylous fluid were withdrawn. The sac being laid open, the tunica vaginalis appeared quite normal. The testicle also was normal, but on its upper and back surface, near its junction with the cord, was observed a smooth and rounded swelling, similar in bulk and contour to the head of the epididymis. Projecting from this was a nodule, resembling the button-like granulation often observed at the orifice of a long-standing fistula. The nodule was moist, though no orifice upon it could be discerned. As, however, it was assumed to be the source of the leakage, it was transfixed throughout its base by a needle, armed with a double carbolized-gut ligature, and after each ligature had been tied was cut away. On the cut surface of the stump was recognised a large patulous orifice of a vessel, from which oozed a milky fluid. The lumen of the divided vessel was recognised also in the removed nodule. The patient made a good recovery, and five months later the cure was reported permanent. Microscopical examination of the removed nodule showed a cavernous structure, some of the spaces being filled with blood, while others, it is believed, were lymphatic vessels.

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* Dr. W. M. Martin states that Dr. C. H. Martin (senior) was the first to demonstrate the existence of a lymphatic varix on the surface of the tunica vaginalis. In a case of chylocele (*Amer. Med. Bi-weekly*, Louisville, Ky., vol. ii. No. 25, p. 615, June 19, 1875) he opened the tunica vaginalis, recognised a ruptured varix at the junction of the cord with the testis, and after stripping it off surrounded the base with a silk ligature. On the cut surface of the stump were seen the open orifices of several small vessels.

In his paper in the *Annals of Surgery* (*loc. supra cit.*) Dr. Martin states that filaria were not discernible in this case, either in the blood or the chylous fluid, though carefully searched for, and hence the theory of inflammatory lymphatic obstruction represented, doubtless, the real morbid condition. The weak points in this ingenious theory are, to my mind, two: (1) that the enlargement of the scrotum had existed for four years before the attack of gonorrhœa, when it increased rapidly; (2) that while gonorrhœal epididymo-orchitis is very common, fatty hydrocele is extremely rare.

(D) According to this view, the presence of fat-containing fluid in a hydrocele is believed to be due to *degenerative changes* taking place either *in the fluid of an ordinary hydrocele, or in the epithelium of the surrounding tunica vaginalis* (Klebs). Mr. Pearce Gould has advanced this theory in explanation of the following case (*Lancet*, 1890, vol. i. p. 893): The patient, aged sixty-one, stated that twenty-five years before he struck the left testicle, and had a severe attack of inflammation which left the epididymis enlarged. Four years ago he went to Australia, where he remained two years, and for the last eighteen months there had been an increasing swelling in the left side of the scrotum, with the characters of a vaginal hydrocele. When this was tapped, the fluid that first flowed was pale straw colour and nearly clear, but at the end it came quite thick, like pea soup. The amount removed was 3 ozs. The testicle was slightly enlarged, the distinction between it and the epididymis being obliterated, testicular sensation was normal. The fluid, when set aside, separated into two parts. The greater part became quite clear, of a greenish yellow colour, with fine filmy flakes in it. Surmounting this was an opaque yellow layer half an inch thick. A drop of this "cream" was found to consist microscopically of fine fat granules and minute oil drops, there was no cholesterine and no spermatozoa. About five months later Mr. Pearce Gould again tapped the patient and drew off perfectly clear straw-coloured fluid. Mr. Gould gives the following reasons for adopting Klebs' view that these cases are to be explained by fatty degeneration of the endothelium of the tunica vaginalis. "Traces of fat are to be detected in ordinary hydrocele fluid, and if such fluid is set aside to stand epithelial cells undergoing fatty degeneration can be found in the slight deposit that forms. There seems, then, fair reason to assume that the small quantity of fat in ordinary hydrocele fluid comes from the endothelial cells, and if that is so, it is not unreasonable to attribute the presence of an excess of fat to an exaggeration of the same endothelial degeneration. Mr. Gould finds further support for his view in the fact that that same cholesterine which is often present in hydroceles is also found by pathologists in the seat of fatty degeneration, as in patches of atheroma, largely also in degeneration of nerve-tissue in which fat abounds. He "would therefore regard all these cases as due to degenerative changes in the endothelium: in the one group resulting in the formation of cholesterine, in the other group resulting in fat. In both groups degeneration may be of varying intensity with corresponding variations in the character of the fluid. What condition it is which governs this degeneration, or why it often results in the formation of cholesterine, and very rarely in the formation of fat, are at present unsolved problems."

Mr. Shattock (*Path. Soc. Trans.*, 1884, p. 250) suggests that another view which may be taken of the nature of the fluid in fatty hydroceles is, that "it has resulted from a subacute suppurative process occurring in connection with a hydrocele, and which has been followed by fatty degeneration and disintegration of the corpuscles, the fluid representing a stage in that process of which the ultimate result is caseation. Such a result is seen, indeed, not only in the case of abscesses, but at times after suppuration of serous membranes. As a good instance of the latter condition, there is a specimen in University College of a heart in which the pericardial sac is filled with a white putty-like substance, which, it must be assumed, has resulted from degenerative changes occurring in a purulent fluid." *

The following case is the only instance of hydrocele with fatty contents which has been under my care. In the point of age, it is, I believe, unique. Before operation I was quite unable to explain the want of translucency, unless bleeding had taken place.

A Case of Hydrocele of the Infantile Variety with Fatty Contents. Radical Cure by Antiseptic Incision.—R. B., aged six, was admitted into Guy's Hospital under my care, November 1888. The left half of the scrotum was occupied by a pyriform swelling nearly three inches long, reaching up to the external ring. The scrotal tunics were much stretched by the swelling, but otherwise natural. The swelling was irreducible; when the patient coughed an impulse could be felt at the neck of the swelling, this impulse becoming much more distinct along the canal. No evidence of a bubonocele could be detected here. The swelling was dull on percussion, it fluctuated readily and gave a thrill. It was stated to have existed since birth. When examined for translucency most of it appeared opaque, a little translucency being detected on either side, posteriorly. An incision was made from the external ring to the fundus scroti. The coverings were found to be extremely dense, perhaps from the pressure of a truss which has been worn. The sac was much thickened and fleshy-looking. On opening this, a jet of milky fluid with a tinge of yellow came out, so that at first I thought I had opened a piece of small intestine. A finger introduced into the sac was arrested at the external ring. The structures of the spermatic cord were separated by the upper part of the swelling, the pampiniform plexus lying in front, while behind, and intimately adherent to the sac, was the vas deferens. These structures were carefully separated as high as the external ring. A peculiar nodule-like body which had been felt inside the sac as soon as this collapsed, proved to be a small fatty mass, situated in the substance of the tunica vaginalis and covered by its serous membrane. It lay at the upper part of the sac, thus removed from the testis and epididymis, and attached by a sessile base to the tunica vaginalis. The sac, having been freed, was cut through above the testicle and again just below a chromic-gut ligature placed at the level of the external ring. The patient made a good recovery.

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* See also Mr. Hilton's account of an old abscess and Dr. Odling's analysis, *Rest and Pain*, 4th ed., p. 386.

I am quite unable to explain this hydrocele. The escaping fluid contained fat granules and some bodies not distinguishable from leucocytes, but not in sufficient quantity to say the fluid contained lymph. No spermatozoa or filaria were found. The boy's blood was not examined, as he had never lived out of London. The sessile body in the sac consisted of fine fatty tissue. No hairs or sebaceous structures suggesting a dermoid origin were present. There was no patent vessel on the surface, as in Dr. Martin's case (p. 18). The lymphatic glands were not enlarged.

Symptoms and **Diagnosis.**—The latter is often obscure, owing to the fact that translucency is absent or doubtful. In other points, pyriform shape, fluctuation, slow painless progress, the disease resembles ordinary hydrocele. In many cases both sides have been simultaneously affected. Wherever there is a possibility of the patient having been exposed to filaria, an examination should be made of the blood, especially at night-time, and other evidence, as chyluria, commencing lymph-scrotum or elephantiasis should be sought for.

Treatment.—Incision should be resorted to, with antiseptic precautions, after the method given at p. 154. While injection with iodine has proved successful, it is certainly not likely to be so reliable in those cases where escape of lymph may be taking place from a leaking lymphatic. A free incision enables us to deal with this, as in Dr. Martin's case. On the same grounds, with the possibility of a leaking vessel being present, the injection method may not be without special danger here.

SECTION VI.

ENCYSTED HYDROCELE OF THE TESTIS.

Here the fluid is contained in a cyst or cysts, distinct from, but close to the cavity of, the tunica vaginalis. The above title is employed to distinguish this form of encysted hydrocele from those localised collections of fluid which are sometimes met with in the cord.

Synonymous terms are encysted hydrocele of the epididymis, a better one, as these hydroceles originate in relation with the epididymis rather than the testicle. Spermatocele is not a correct term, as these cysts do not always contain seminal fluid. On this account some writers (*e.g.*, Mr. Curling, in the last edition of his book) have reserved the term spermatocele for those cases in which, owing to some obliteration of the vas deferens, or the tail of the epididymis, cystic dilatation takes place in the seminal duct behind. MM. Monod and Terrillon (*loc. supra cit.*, p. 532) have gone further, and include under the heading spermatocele not only the condition just mentioned, in which there is actual dilatation of the epididymis from obstruction in front, which they call "permanent dilatation" of the seminal ducts, but also a "temporary distension" rather than dilatation of these parts, such a condition as is brought on by intense venereal excitement, unsatisfied. This condition should be termed engorgement, and to include it under spermatocele is, I think, incorrect on etymological, pathological, and clinical grounds alike. If the term spermatocele has any meaning it should be a tumour containing seminal fluid, and therefore almost certainly a cyst, a totally different condition. If the above engorgement was capable of bringing on a dilatation amounting to spermatocele, it should be much more commonly met with in young adults in full sexual vigour. But the truth is, that while we see well-marked instances of engorgement from time to time in those who have exposed themselves to its exciting causes, we find an aching, painful, tender testis, but no cyst-like dilatation of the epididymis.

While I admit that for the sake of a correct pathology encysted hydrocele—as the fluid is here always contained in a cystic cavity, large or small, single or multilocular—should be described under the heading of new growths, or cysts of the epididymis, I have retained its account here for convenience' sake; an arrangement which is also justified from the close contiguity of these encysted hydroceles to the testis, and the facility with they may be confused with hydroceles of the tunica vaginalis.*

Encysted hydrocele of the testes includes two varieties :—

(i) Not uncommon. **Encysted Hydrocele of the Epididymis,** the fluid being encysted in the close vicinity of the epididymis.

(ii) Very rare. **Encysted Hydrocele of the Testicle proper,** the fluid being here encysted between the tunica albuginea and the inner surface of the visceral tunica vaginalis.

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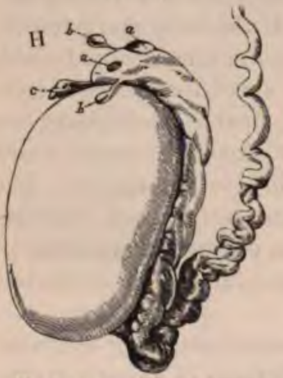
* Other forms of hydrocele (*e.g.*, inguinal) have been described under the heading "Retained Testis," p. 62. Again, Hydrocele of the Cord will be dealt with in Part II., DISEASES OF THE CORD.

Encysted Hydrocele of the Epididymis. This i uncommon, and includes two distinct kinds of cysts. These widely in structure and clinical importance, but having in co their position, which is always near to the epididymis, they be described here as follows:—A. **Cysts, small, sub-serous usually appearing externally to the epididymis, unimpo clinically, and very rarely containing spermatozoa.** B. **(larger, originating within the tissue of the epididymis, therefore parenchymatous, important clinically, and (containing spermatozoa.**

A. **Small Sub-serous Cysts** (Fig. 27).—It is by no n uncommon to meet with, after middle life, small cysts the si a pin's head, a millet seed or a projecting upon the convex free tremity of the head of the epidid and also, though more rarely, upo body or near its tail. M. Gos (*Arch. Gén. de Méd.*, 4^{me} sér., t. p. 24), to whom we owe the distin between the small or sub-serous the larger or parenchymatous c never found them in children, and occasionally in subjects between berty and thirty-five. On the (hand, after forty they became tremely common, being present in thirds of the testicles examined. may be sessile or pedunculated, a the latter case may become one s of the "loose bodies" occasionally with in the tunica vaginalis. The always situated on the surface, beneath the serous membrane; bu shall see later that there is some reason to believe that they more deeply, and that this independence from the parenchyn only apparent. They are usually multiple, three, four, or fi number. They are very firm to the touch, as if solid, but condition is merely due to the tension of their fluid contents. puncture a fluid escapes, usually clear, limpid and transpa in other cases of a turbid character. Gosselin, and most w after him, have stated that spermatozoa or spermatic cell never found in these cysts. According to Kocher this is

FIG. 27



H, Cyst of the epididymis in the various stages of their development. *a a*, Small cysts, slightly raising the tunica vaginalis. *b b*, Small pedunculated cysts. *c*, Small process of the serous membrane at the junction of the epididymis and the body of the testicle. (Curling.)

constantly the case, Lewin having detected spermatozoa eight times in his investigations, in which 100 testicles were examined.

Owing to their small size, these cysts usually escape injury though in so exposed a situation. Sometimes they rupture, leaving behind traces of their existence in minute folds of serous membrane. This rupture may possibly be of importance in some cases by originating hydrocele of the tunica vaginalis.

Structure.—This has usually been described as a fibro-cellular envelope with an epithelial lining. M. Monod (*Congr. franc. de Chir.*, 1885, p. 552) has shown that in reality the structure is far more complicated, and—what is of more importance—this points to the origin of these cysts. He finds evidence of the three following layers: (1) a layer of connective tissue with parallel fasciculi—*i.e.*, the tunica vaginalis; (2) a layer of connective tissue enclosing ducts resembling closely those of the epididymis, some dilated, others atrophied; (3) the wall proper of the cyst itself. This is everywhere closed and everywhere separated from the preceding, thus explaining the readiness with which these cysts may be shelled out, and the fact that liquids injected into the ducts of the epididymis do not find their way into the cysts. Of the above three layers the second is sometimes wanting, having probably existed at an earlier date, but having disappeared later on.

Pathology.—*Two important views* have been held with regard to the origin of these small or sub-serous cysts. (*a*) That they originate in traces of the Mullerian duct (p. 15) which have not been completely obliterated. Mitchell Banks (*Prize Thesis*, Edinburgh, 1864) ably supported this theory, relying chiefly upon the fact that these cysts appear just where traces of this duct are met with. Klebs objected to this view because these cysts are not met with in early, but in rather advanced life. Kocher (*loc. supra cit.*, p. 315) has supported this objection, arguing that in those cases where cysts are found to originate in relics of fœtal structures, these are met with in childhood, as in the case of encysted hydrocele of the cord arising in unobliterated traces of the peritonæal funiculo-vaginal process.

β. According to this view the small cysts of the epididymis are not, to begin with, really sub-serous, but start in the substance of the epididymis, and are connected, in their origin, with certain changes that habitually take place in the epididymis of those who have passed middle life. According to this view, they are comparable with like cysts met with in other obsolescent and shrinking organs—viz., the involution-cysts—which occur in the breasts of women at and after middle life. M. Gosselin seems to have had this explanation in his mind in the above-quoted paper, when he stated that in the varying frequency of these cysts at different ages lay the explanation of their origin. He held that, as the cysts lie superficially, and not in any relation to the structure proper of the epididymis or testis, as they can be dissected out entire, and as by fine injections no communication can be made out to exist between them and the seminal tubes, they cannot have originated in one of these. Rejecting this theory, M. Gosselin explains the increasing frequency with which, as life goes on, these cysts are met with by the diminished activity of the testis. Thus, while this organ is functionless—in infancy or childhood—they are never found; during the time of its greatest activity they are very rare. On the other hand, after forty, especially in old age, these cysts occur with great frequency. In other words, the testis has, after puberty, a powerful tendency to secrete; as long as the seminal fluid is formed in abundance this tendency finds ample scope, but when this diminishes, the above tendency becomes misapplied in the formation of these cysts. Writing of this view of M. Gosselin[*] in 1882 (*System of Surgery*, vol. iii. p. 494), I said: "If by this M. Gosselin means that as the substance of the testis and epididymis, becoming increasingly functionless, waste and shrink, the sub-serous connective tissue is here and there drawn out into cavities which ultimately become true cysts, it is easy to see a connection between these cysts and the functional activity of the testis; otherwise his view, ingenious as it is, appears to me too theoretical for acceptance.

M. Monod (*loc. supra cit.*, p. 527) and the same writer, with M. Arthaud ("Path. et struct. des petits kystes de l'épididyme," *Arch. de Phys. norm. et path.* 1885, t. v. p. 233), have shown that the above view of Gosselin, that the formation of these cysts goes with the diminished functional activity of the testicle, is really founded on pathological facts. Their view is that these small cysts arise not on the surface, but in the structure of the epididymis, and that they arise in enlargements of certain ampullary dilatations which naturally occur in the ducts of the epididymis, these dilatations themselves being brought about by certain alterations which advancing age brings about in this part. The following are the chief arguments on which this view is based:

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[*] M. Gosselin's exact words are—" En un mot, la nature a donné a cet organe, à sortir de la puberté, un pouvoir, un molimen sécréteur. Le molimen se réalise suffisamment tant que la sperme est séparé en abondance ; mais lorsque vient à diminuer cette sécrétion, la tendance de l'organe n'est plus satisfaite, et le molimen se traduit encore par les productions accidentelles."

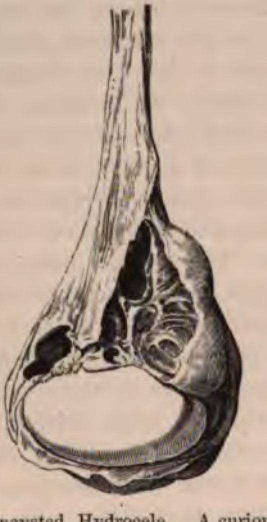
(1) As showing the close connection between these cysts and the ducts of the epididymis it is pointed out that the epithelium met with in the one closely resembles that which lines the other. (2) Certain changes which take place, as life advances, in the parenchyma of the epididymis are thought to leave no doubt as to the origin of these cysts. Thus, in nearly all subjects who are over fifty, alterations which may be called senile are met with in the epididymis. These consist mainly in a sclerosis of the intra-canalicular connective tissue. This change brings about widening of some of the ducts, obliteration and atrophy of others, and thus a formation of cystic cavities. The writers point out that a similar process of sclerosis and cyst formation takes place in the kidney, and glands where the excretory ducts have been interfered with. Two chief objections may be brought against this view: (*α*) The habitual absence of spermatoza in these small cysts. To this the above writers reply that, to begin with, this absence is not as constant as was once thought (p. 187), and, further, that because no spermatozoa are found in these cysts at the time of examination it does not follow that they have not been present at an earlier period. (*β*) The superficial, sub-serous, position of these cysts, apparently isolated from the parenchyma of the epididymis. To this objection it is replied that the isolation is more apparent than real, and attention is called to the structure of one of the walls of these cysts (p. 187), and to the process of cyst-formation which is now proved to be of common occurrence in the epididymis close by.

While the above explanation holds good in the case of by far the largest number of the small cysts of the epididymis—viz., those met with at and after middle life, another must be sought for in the case of those small cysts which, though rarely, occur at an earlier age. To these the first given hypothesis (p. 187), perhaps, applies—viz., (*a*) that of congenital relics, or the cystic transformation of remnants of the Mullerian duct, &c. (p. 187), or (*b*) traumatic origin, viz., some injury or inflammation of the ducts of the epididymis.

Course and Diagnosis.—As a rule, certainly, these small cysts remain of minute size, and give rise to no clinical symptoms. The possibility of their rupture into the tunica vaginalis, and thus starting a vaginal hydrocele, has already been alluded to (p. 102).

(B) **Large Cysts, often containing Spermatozoa.**—*Anatomy, Structure, and Contents.*—These are met with close to the upper part of the epididymis, most frequently between it and the upper limit of the testicle: less often, they appear just above the epididymis, as a continuation of it. They certainly arise beneath the external areolar investment of the epididymis—that is, inside its structure—and thus in close relation with the seminal ducts, especially the vasa efferentia; from this circumstance the term parenchymatous has been given to them. They lie outside the tunica vaginalis, the visceral layer of which they raise as they increase in size; occasionally they come gradually to project into this cavity. They are usually single: more than two or three are very rare. In some cases, when apparently multiple, these cysts are compartments of a single cavity, divided by delicate septa (Fig. 28). The capacity * of these cysts varies much, but usually does not exceed 4 to 5 ozs.

FIG. 28.



Encysted Hydrocele. A curious sacculated arrangement is produced by the development of numerous contiguous cysts. The walls of these are cut away in part. The position of the testicle (horizontal as in Figs. 35, 36) is noteworthy. (Lond. Hosp. Coll. Mus.) (Curling.)

As they increase, which they do very slowly and persistently they push their way between the testis and epididymis, separating them, and even unravelling the tissue of the former. By this means the vasa efferentia and the coni vasculosi may be stretched over and spread out by such a cyst, a point of much importance when their origin is discussed (*vide infra*), and the presence of spermatozoa explained. In structure the cysts are composed of a very delicate fibro-cellular tissue, which becomes thickened in those of long standing, and a very fine layer of pavementepithelium. According to Hockenegg ("Ueber cysten am Hoden u. Nebenhoden," *Wien. Med. Jahrb.* 1885, S. 149), the above is only true of long-standing cysts: in the more recent ones the epithelium is cylindrical and arranged in several layers. They are met with at any age after twenty-five, but more frequently before than after forty-five (Kocher and Hockenegg). The contents vary. Thus they may be limpid and colourless, with only a trace of albumen. It is quite exceptional to find the fluid of a straw colour and albuminous, and it is often impossible to find a trace of albumen.* Very rarely it is brown (perhaps from an old hæmorrhage), ropy and mucoid.

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* A case of very large bilateral encysted hydrocele in a man, aged fifty-eight, is recorded in the *Med. Times and Gaz.* 1853, vol. i. p. 629. The united sizes of these was considerably larger than that of an adult head. On one occasion 49 ozs. were drawn off from the right, and 58 from the left; at another time 28 ozs. and 45 ozs. were withdrawn. The fluid was milky, and contained spermatozoa.

If not limpid and colourless, the fluid is usually opalescent, milky or rather like weak soap and water, this character being due to the presence of spermatozoa—the rule in these cysts. It is in the larger cysts that these are found with most certainty, and in the greatest abundance. In those of smaller size, as pointed out by Gosselin, the contents are more likely to be serous, an important point in the origin of these encysted hydroceles to be again alluded to later. The spermatozoa often show lively movements for some time after the fluid has been removed; at other times they are quite quiescent, or show signs of decomposition: thus all traces of their tails may be lost, and only small oval nuclei-like bodies may be found, which are, in fact, the heads of the spermatozoa. Usually, however often the cyst is tapped, spermatozoa are present from first to last. In rarer cases, though present at the first, they are absent at later tappings, or the reverse may be the case. M. Gosselin has even found that, in a few cases, spermatozoa abounded in the fluid of one of these cysts, though they were quite absent throughout the whole of the seminal tract.

In reaction the fluid is alkaline. The addition of acetic acid generally causes effervescence, from the presence of alkaline carbonates, and causes no cloudiness as would be the case in a solution containing mucus. The richness of the fluid in salts between the cyst and the seminal tubules. The cyst was adherent to the upper extremity of the testicle, and a section showed that a certain number of seminal tubules opened into the cavity of the cyst by orifices so minute as scarcely to admit a bristle.* Passages so minute might easily have been overlooked.

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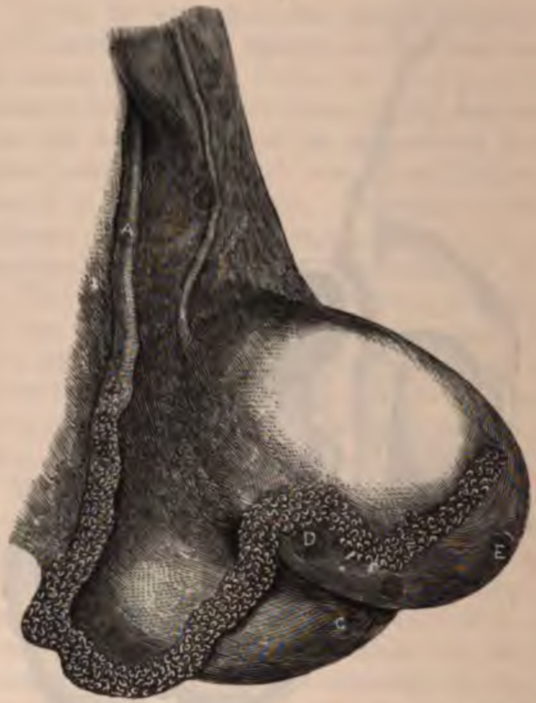
* MM. Monod and Terrillon (*loc. supra cit.*, p. 533) make this a point of cardinal importance. From the presence of albumen and a fibrinogenous substance the liquid of vaginal hydrocele belongs to the "serous" fluids, analogous to blood serum and of inflammatory nature—*e.g.*, pleurisy, hydrothorax, ascites, hydrarthrosis, hygroma. The fluid of encysted hydrocele, on the other hand, belongs to the fluid called "seroid," very different in composition to blood serum, and having nothing to do with inflammation in their origin, *e.g.*, cerebro-spinal fluid, hydatid fluid, the aqueous fluid of the eye, &c.

FIG. 30.



A, Vas deferens. C, Testicle. D, Epididymis, with its ducts loaded with mercury, expanded over the cyst, E. (Curling.)

Kocher (*loc. supra cit.*, p. 316), in the case of a cyst the size of a hazel-nut, situated on the front of the head of the epididymis, containing clear colourless fluid with a few stiff spermatozoa, was able to inject the vasa efferentia by means of a solution of carmine thrown into the cyst.

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* In both these cases the communication was between the testis (not the epididymis) and the cyst. This, easily separable from the epididymis, cord and tunica vaginalis, was connected at a small spot to the upper and hinder part of the rete testis. A section at this spot showed a number of fine openings on the inner surface of the cyst and some canaliculi of the rete anastomosing here.

The above have been verified by dissection. Dr. Menzel, of Trieste, has recorded (*Lond. Med. Rec.*, 1877, p. 249) a case in which the communication seemed to be capable of proof in the living subject. Thus, when the testis was compressed the cyst became distinct, and *vice versâ*.

The objection that is made to the above argument is that in many cases no communication can be made out between the cyst and the seminal apparatus, while in some spermatozoa are wanting. To the first it may be replied that, considering how minute the opening has been found to be in several cases, it is not likely that it will always be discovered. Again, it does not follow because no opening can be found at the time of examination that none has ever existed. In many cases it may have been obliterated by gradual pressure, or by inflammation. The second objection, or the occasional absence of spermatozoa, may be answered in the same way. If the communication between the cyst and a seminal tubule has been long shut off, the spermatozoa that at one time gained an entrance may have disappeared. We do not know how long they can live in such cysts, but we do know that in some cases they are found dead and motionless, in others broken up. In the one case, where a careful examination finds no trace of them, we are quite justified in believing that they have disappeared.

(β) Certain French writers have brought forward evidence, based upon microscopical sections of the epididymis, that the larger cysts arise in dilatation of the seminal canals. Thus, M. Dolbeau, (*Bull. de la Soc. Anat.*, 1856, t. i. p. 20, and 1858, t. iii. p. 134) showed that it was not uncommon to meet with, in the course of the vasa efferentia, fusiform and spherical dilatations containing a liquid rich in spermatozoa. More recently, M. Réclus (*Bull. de la Soc. Anat.*, 1875, t. x. p. 266) and M. Verneuil (*Bull. de la Soc. de Chir.*, t. viii. p. 412) have also maintained that these cysts of the epididymis originate in lateral cæcal dilatations of the ducts of the epididymis, which being gradually separated become independent cavities.*

(2) M. Gosselin (*Arch. Gén. de Méd.*, t. xvi. p. 179) considers that these cysts originate in the rupture of one of the seminal tubules, especially one of the vasa efferentia. Some drops of seminal fluid thus escape into the surrounding connective tissue;

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* M. Sappey (*Traité d'Anat. descript.*, 2^e edit. t. iv. p. 610) supports the above by his description of small cysts met with in the vasa efferentia, which at first communicate with the lumen of the ducts, but later on, when the size of a pea, become isolated.

the gradually forming cyst around the escaped fluid, after a time furnishes additional fluid, while the ruptured duct gradually cicatrises and becomes obliterated by the development of the cyst. M. Gosselin held that the rupture of the seminal duct i consecutive to its obliteration—a condition which he has shown to be not uncommon in the head of the epididymis (p. 200).

According to MM. Monod and Terrillon, M. Gosselin later o abandoned this view, as incapable of exact proof, and adopted the theory that these cysts originate in fœtal relics (*vid. infra*).

(3) Mr. Curling believed that the rupture of one of the seminal tubes was a secondary step, the independent formation of the cyst in the connective tissue close by being the primary stage.

Mr. Curling found on investigating these cases that in the majority of them a small cyst had long existed in a stationary condition, and had enlarged after a slight blow; the consequent inflammation and admission of additional spermatozoa to the contents of the cyst having led to its increase in size. Mr. Curling supports his view by the undoubted frequency with which the ducts of the epididymis are stretched out by and spread over such a cyst, a condition which is well represented in Fig. 30. An observation of Mr. Curling's, that spermatozoa are rarely found while the cysts are small, and are therefore usually not formed there originally, but are a subsequent addition to their contents, is also in favour of this view.

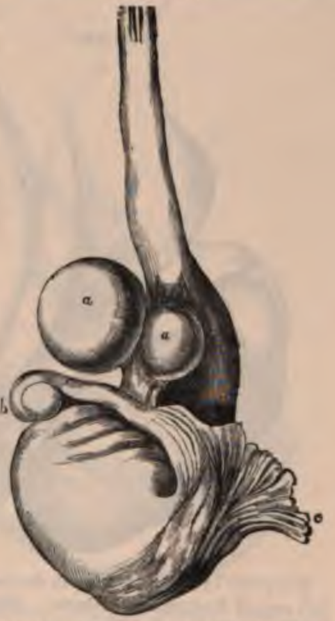
The following case, which was under Mr. Bryant's care (*Pract. of Surg.*, vol. ii. p. 186), probably illustrates the effect of a blow in causing rupture of a seminal tube:—

A man, at sixty, had an encysted hydrocele of the left testicle, of twenty years growth. The increase had been very slow till the last month, when the swelling had doubled its size, this rapid change having followed an injury produced by a fall. The scrotum contained an irregular cystic swelling on its left side, evidently made up of several cysts, of which three of large size could readily be distinguished, the third being baggy. The testis was found on the inner side of the swelling. The largest cyst was first tapped, many ounces of milky fluid being drawn off. The second tense cyst was then tapped through the same opening, with the same result, and the fluid collected in a different glass. The third cyst was also tapped, but in this the fluid was quite watery. The first two contained abundance of spermatozoa; the third did not contain any. A good recovery followed.

(4) Another and different explanation refers the origin of these cysts and their contents of spermatozoa to certain fœtal relics which occur with especial frequency in the neighbourhood of the head of the epididymis. Here we have the three following remains of fœtal structures, viz. :—

(a) *The corpus innominatum, parepididymis*, or *organ of Giraldès* —that little body which lies in front of the cord immediately above the head of the epididymis, and beneath the upper part of the tunica vaginalis. This varies in size from a mere speck to a body four or five lines long, consisting of several minute irregular masses which can be resolved into small convoluted tubes, lined with squamous epithelium. M. Giraldès considered that encysted hydrocele originated in the dilatation of the above tubules. It is well known to surgeons that encysted hydroceles originating near the epididymis, and containing spermatozoa, do sometimes extend for some distance up the cord. Such cysts may well, when small, have originated in the tubules of the organ of Giraldès. Fig. 31 shows cysts in this position. Though such fœtal relics seem but insignificant, and though there is no case recorded in which an encysted hydrocele can be directly traced to them, it is of great interest to note that equally insignificant relics in the embryo of the female may later on become the seat of cyst-formation between the layers of the broad ligament. I refer to those parovarian cysts which are formed by distension of one of the tubules of the parovarium, or organ of Rosenmüller, a relic of the sexual part of the Wolffian body (as the organ of Giraldès is of the urinary part) and which is situated in the thickness of the broad ligament, between the outer end of the ovary and the Fallopian tube. It is well known that the fluid

FIG. 31.

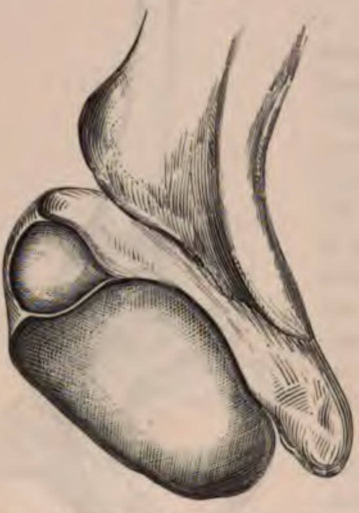


Spermatic cysts. *a a*, Closely connected with the lowest part of the cord, and perhaps originating in remnants of the organ of Giraldès. *b*, One arising in the position of the hydatid of Morgagni. *c*, Tunica vaginalis reflected. (Path. Mus. Univ. Camb.)

of these cysts is watery and limpid, and of a low specific gravity, usually below 1005. On this point it is of very great interest to note that a few observers, including MM. Monod and Terrillon have found in rare cases cysts of the epididymis containing an absolutely watery fluid, similar to that contained by parovarian cysts.

(β) *Vestiges of the duct of Müller, especially the hydatid of Morgagni.*—It is well known that the above duct, which in the female forms the Fallopian tube, uterus and vagina, becomes almost entirely abortive in the male. Remains of it are always to be found in the hydatid of Morgagni, while in some cases the duct can be traced as it runs from the globus major, between the testis and epididymis in the digital pouch, and so downwards to the globus minor, where it is lost amidst the other structures in the spermatic cord, to reappear again as the sinus pocularis in the prostatic urethra. The hydatid of Morgagni is constantly present between the top of the testis and the globus major, situated beneath the tunica vaginalis and attached to the testicle by a peduncle of varying length. Its structure is cystic normally, before any changes are brought about by inflammation, the small fibrous cyst being lined with tessellated epithelium. Fig. 32 (Prep. E. E. 70, St. Thomas's Hospital Museum*) shows the presence of an encysted hydrocele in the position of the left hydatid of Morgagni. One cyst in Fig. 31 also shows the same thing. Fig. 33 (Prep. xiii. 26, St. George's Hospital Museum) shows an encysted hydrocele, situated a little lower down—*i.e.*, in the digital fossa corresponding to and very likely arising from the track of the Müllerian duct.

FIG. 32.



Encysted hydrocele arising in the position of the left corpus Morgagni. (Osborn.) (Prep. E. E. 70, St. Thomas's Hospital Museum.)

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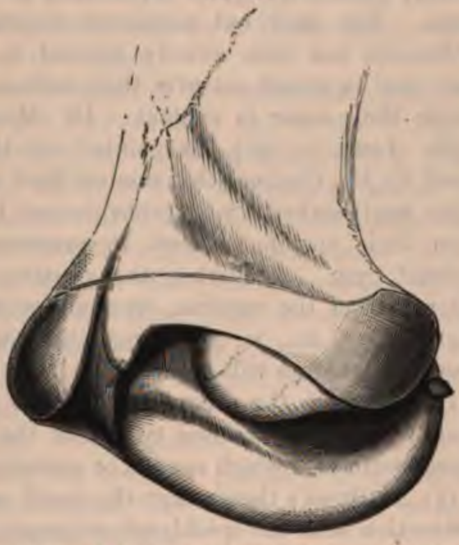
* In the same collection, Fig. 69, E. E. shows a cyst of considerable size extending somewhat upwards along the cord. It is figured by Sir A. Cooper, "Testis," Pl. xi. fig. 3.

(γ) *The Vas Aberrans of Haller.*—This diverticulum, as a cæcal tube arranged in a convoluted mass amongst the structures in the lower part of the cord, opens into the vas deferens at its commencement, or into the lower part of the epididymis. This structure, usually but not always single, appears to be the remains of one or more of the tubes of the Wolffian body still adhering to the excretory duct of that body, which explains their communication with the tube of the epididymis or the vas deferens. From the position of the diverticulum, low down upon the excretory apparatus of the testicle, and therefore at a point somewhat remote from the usual site of encysted hydroceles, it would not appear to be a common source of origin of these. Luschka, however, having found this vas aberrans converted into a simple cyst, has given reason for believing that it forms, occasionally, an encysted hydrocele.

While the above theory must remain not proven, it is rendered very probable by the fact that these cysts so frequently originate in the neighbourhood of the head of the epididymis, and that in this same neighbourhood fœtal relics abound. Thus when they are found higher up, encroaching upon the cord, encysted hydroceles may have arisen in a hitherto quiescent organ of Giraldès; when somewhat lower down, the hydatid of Morgagni or vas aberrans may have been their starting-point.

FIG. 33.



Encysted hydrocele situated between epididymis and body of right testis. (Osborn.) (Prep. xiii. 26. St. George's Hospital Museum.)

The question still remains, How do the spermatozoa find an entrance? In some cases, no doubt, a communication remains unobliterated between the relic and one of the ducts at the head of the epididymis, similar to that which exists between the vas deferens and the vas aberrans, and which has been proved to exist in other cases. If this be so, the frequent position of these encysted hydroceles near the epididymis will be in accordance with the frequency with which obliterations, temporary or permanent, take place in the tortuously coiled tubes of which this structure is composed, after inflammation, venereal and otherwise.* Owing to such obstruction, from inflammatory matting together of the surrounding peritubular connective tissue, regurgitation of the seminal fluid might take place from the vas deferens or from one of the tubes of the epididymis into one of the above-mentioned fœtal remains with which they are still in communication. But usually there is a simpler explanation of the entrance of spermatozoa. The slow but persistent increase in size of encysted hydroceles has been already alluded to, and the way in which they tend to spread out over their surface the seminal ducts with which they come in contact. Dr. Moxon (Wilks and Moxon, *Path. Anat.*, p. 540) has pointed out that the fact (previously noted by Mr. Curling) that seminal fluid is not found in the cysts when small makes it very probable that it enters the larger ones from their opening a duct by pressure, just as bile enters a hydatid cyst. And when the situation of these cysts on the outer part of the scrotum, especially exposed to friction, sudden slight blows, &c., is considered, the extreme probability of the above explanation will be recognised.

Passing from the theory of retention cysts, and that of origin from fœtal relics, we find two more theories as to the origin of these hydroceles which cannot be entirely passed over.

(5) M. Broca's theory that the small and large cysts found in connection with the epididymis originate in the same way (*Traité des Tumeurs*, t. ii. p. 99). This view is put forward because no established distinction between the large and small cysts has been anatomically demonstrated, and because it is held that the characters proper to large cysts show nothing which might not be due to enlargement of the small cysts. M. Broca is, therefore only disposed to admit one kind of cyst in the epididymis, and holds that all, large or small, with or without spermatozoa, arise in cavities independent of the seminal passages, and have their origin in the *débris* of the Wolffian body.

To this view of M. Broca the following objections may be raised:—(1) That a very important difference between the structure of the small and large cysts have been proved to exist by MM. Monod and Arthaud (*vide supra*, p. 188); (2) that in a large number of cases there is strong reason to believe that these cysts are not independent of the seminal passages, and (3) as already stated, any view of this kind which maintains that the small cysts of the epididymis, which are not met with till late in life, originate in fœtal relics, takes no notice of the very important fact that this is quite contrary to what we know of other vestiges of embryonic structures, whether we look to the processus funiculo-vaginalis, the organ of Rosenmüller, the remains of the branchial clefts, or dermoid cysts: in one and all of these we find that if they give rise to morbid growths, they do so before middle life, and, as a rule, at a much earlier stage.

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* See Gosselin, *Arch. Gén. de Méd.*, t. xiv.; and Lewin, *Studien über Hoden*, p. 16.

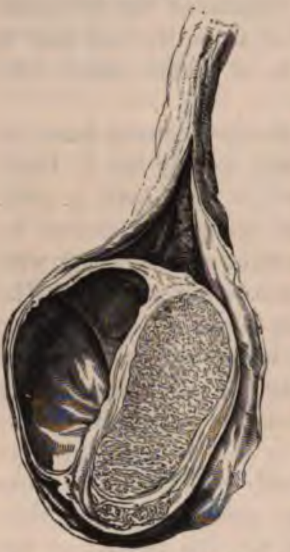
Another explanation of the origin of the spermatozoa found in encysted hydroceles was put forward long ago by Sir J. Paget (*Med. Chir. Trans.*, vol. xxvii. p. 401; *Lect. on Surg. Path.*, p. 418). This view, though it has failed to find acceptance, cannot be entirely passed over on account of the weight and authority with which everything from the above-mentioned writer comes. "The most probable explanation of these cases, therefore, seems to be that certain cysts seated near the organ which naturally secretes the materials for semen may possess a power of secreting a similar fluid. And this explanation is in some measure supported by the analogy of those cysts which are found in the ovaries, and more rarely in other parts of the body, especially beneath hairy parts of the skin, and in which the ordinary products of the skin, such as epidermis, sebaceous matter, hair, &c., are formed on the cutaneous tissue of their internal surface."

With reference to this explanation, Mr. Curling observed that it is not satisfactory, as the cysts in which the spermatozoa are found are not formed in connection with the secretory part of the organ but with the excretory. And I may add that even if it were granted that the above explanation might hold good for analogous cysts with simpler contents, it can scarcely do so in the case of these cysts, whose contents are a fluid so complex and unique as the semen; while their structure, a wall of connective tissue with a layer of tessellated epithelium, is yet so simple and unspecialised.

M. Gosselin (*loc. supra cit.*) writes on this subject:—"Pour le sperme et les animalcules, le lieu d'élaboration est dans les tubes séminifères, et les lois physiologiques ne permettent pas de croire qu'un kyste accidentel, sans aucune communication avec les tubes, puisse donner naissance à un produit semblable. Les kystes du testicule ne sont pas plus capables de produire des animalcules que ceux de l'ovaire des ovules et ceux de rein de l'urine."

(ii.) **Encysted Hydrocele situated between the tunica albuginea and the inner layer of the tunica vaginalis, or in the substance of the tunica albuginea itself** (Fig. 34). These cysts are extremely rare. They are usually single, and from the resistance of their surroundings, of small size. Their situation is usually upon the anterior surface of the testis. A specimen of this kind is shown in (Fig. 34). It was discovered accidentally by Mr. Curling in the course of a dissection. Mr. Hutchinson has described (*Path. Soc. Trans.* vol. vii. p. 246), a case * of a thick walled cyst which arose in the substance of the tunica albuginea itself. It formed a swelling about the size of a goose's egg, somewhat flattened, heavy and elastic. Its upper five-sixths were rounded and tolerably smooth, and were separated by a shallow depression from the lower part, which was soft and felt like the testicle. Pressure on the upper part of the swelling caused only a "numby feel," but when the lowest part was compressed, it felt "as if his testicle was nipped." Castration was performed at the patient's wish. The contents of the cyst were a greyish brown fluid and flakes of lymph. It had internally an organised false membrane, and at its lower part was a growth of solid but softish granulations. This specimen is in the Hunterian Museum, No. 4217. Mr. Hutchinson suggested that this cyst might have arisen from a puncture of the testis in the operation for hydrocele said to have been performed six years before. Supposing an interstitial effusion of blood into the tunica albuginea to have resulted from such a puncture, it is easy to suppose that the organisation into a cyst

FIG. 34.



Encysted hydrocele of the testis proper. The cyst, which contained about two drachms of fluid, is situated in front of the testicle. (Curling.)

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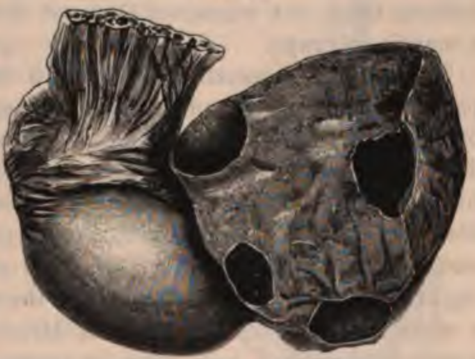
* Another will be found, described by Sir B. Brodie, *Lond. Med. and Phys. Journ.*, vol. lvi. p. 522.

might have ensued thereon. This view is no doubt the correct one, and most of these cysts, whether between the tunica albuginea and the tunica vaginalis or in the substance of the tunica albuginea, probably originate in hæmorrhage, the extravasation being gradually encapsuled.

Symptoms of Encysted Hydrocele.—The following remarks refer to the larger variety of encysted hydrocele of the epididymis. The symptoms are very little marked at first, the onset being very insidious, and the growth of these cysts extremely slow. Allusion has already (p. 196) been made to the fact that rupture of a seminal tube into one of these cysts after an injury may bring about a rapid increase of size. While small, the cyst presents itself as a projection in the neighbourhood of the epididymis, above and to the outer side of the testicle; sometimes it appears behind this organ. It is intimately connected to and moves with the gland, while its state of tension prevents any fluctuation being made out. As it increases, it conceals the testicle and when of about the same size it has been mistaken for an additional one. It is usually separated from the testicle by a furrow, and can also be usually distinguished by the test of translucency and by the result of pressure. As the size increases the shape of the cyst, at first rounded, often becomes somewhat bossy. Mr. Curling, Pitha, and Hochenegg describe the shape of a pear reversed as not unfrequently met with or even as characteristic. This is due to the upper part of the cyst being more distended than the lower. When large and multiple, the outline may become irregular. They seldom attain to the size of a hydrocele of the tunica

FIG. 35.



A testicle with a large multilocular cyst, with very thin walls, attached to the head of the epididymis, in the position where the organ of Giraldès or remains of the Wolffian body is found. The loculi are separated from each other by thin partitions. They contained a transparent watery fluid, in which no spermatozoa could be found. During life the cyst appeared as a soft fluctuating tumour above, and partially obscuring the testicle. It was partially within the tunica vaginalis. (Spec. 4265, Hunter. Mus.; presented by F. S. Eve, F.R.C.S.)

vaginalis.* Spec. No. 2365, in Guy's Hospital Museum is an excellent instance of a large encysted hydrocele. The whole epididymis is much enlarged and converted into numerous cysts with thin translucent walls. One of these cysts measures 2 inches in diameter, and the whole altered epididymis is more than four times as large as the testis. The cysts have a smooth lining, and contained an opalescent fluid rich in spermatozoa. Transparency is usually present; but when the fluid is milky and opaque, or the walls thickened, this evidence will be wanting. Fluctuation and thrill can also be made out in the larger cysts: though if these be very tense fluctuation will be doubtful. And with regard to all these points, considerable difficulty will be experienced in making them out whenever the cyst is small—*i.e.*, of the size of a marble or grape.

The progress is usually so slow and the size so moderate, that pain and the sensation of weight and dragging are not complained of. In rare cases, on the other hand, pain is a marked feature. This may be due to a blow, rupture of a seminal duct and rapid filling up of the cyst. In other cases, as in one recorded by M. Dauvé (*Gaz. des Hôpitaux*, 1867, p. 133) the sensation of weight and tension, coming on after prolonged continence and disappearing after coitus, may be explained by the cyst communicating with a seminal tubule. In other cases Mr. Curling has explained the presence of marked pain, even in cysts of moderate size, by the probability that the epididymis was stretched out by the tension of the cyst.

These cysts may be bilateral; when single it is usually on the right side.

In very rare cases they may extend upwards along the cord, into the inguinal canal, and their dimensions then become considerable. Thus, a case in the practice of Sir J. Lister has been recorded by Mr. Baker (*Ed. Med. Journ.*, 1877, vol. i. p. 1087) in which a large encysted hydrocele, with a history of only four years, extended up into the canal, and also outwards above Poupart's ligament. It was conical, with the apex downwards, the upper part of the swelling being out of all proportion to that in the scrotum.

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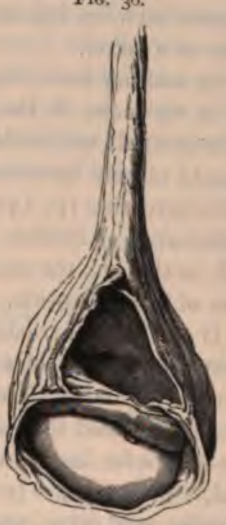
* Dr. Cameron (*Lancet*, 1884, vol. i. p. 842) records a case in which 46 ozs. of fluid containing very perfect spermatozoa were withdrawn. This very large cyst had lasted seven years. It so dragged down the skin of the abdomen, that the orifice of the prepuce alone marked the situation of the penis, which otherwise was entirely hidden. Two drachms and a half of tinct. iodi (*Edin. Phar.*) were injected, with the best possible results.

Diagnosis.—The transparency of the cyst, usually to be made out by careful examination, the sense of fluctuation and thrill, together with the absence of resistance and density, will point out its nature. From ordinary hydrocele of the tunica vaginalis it may be distinguished by its usually slow rate of increase, one of these cysts often existing ten or more years without causing any inconvenience. The shape of the swelling is another point—when small, circular, or somewhat bossy, recalling the outline of a large marble; when larger, or polycystic, irregular or somewhat lobulated, but never of the ordinary pyriform shape, with its large end downwards, met with in hydroceles of the tunica vaginalis. The position of the testis should always be made out by the transparency test, or by careful pressure. If not below and in front, its usual position, the gland will be found below and to one side, usually the inner; it is hardly ever found behind the swelling.

In the majority of cases attention to the above points will be sufficient; but sometimes, when the cyst is small and difficult to fix so as to apply the transparency test, when the position of the testis is altered by adhesions, &c., a diagnosis can only be made by a puncture with a fine trocar, when the character of the fluid will be another and decisive point.

FIG. 36.



Encysted hydrocele. The cyst is above the testicle, which is so displaced by it that its anterior edge is directed downwards. (Curling.) (Lond. Hosp. Coll. Mus.)

On the other hand, large cysts may sometimes cause difficulty in diagnosis. When they extend upwards along the cord, the history of the starting-point, the fact that the swelling cannot be entirely separated from the epididymis, and the results of tapping will help to distinguish these cases from hydrocele of the cord. For the diagnosis from hernia see above, p. 129.

Treatment of Encysted Hydrocele.—On account of the slow rate of increase, occasionally stationary quiescence, and usually

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[*] Mr. Gould (*Lancet*, 1890, p. 894) points out that occasionally an ordinary vaginal hydrocele may, by its circular shape and extension upwards along the cord, be difficult to diagnose from an encysted one. He thinks the above characters will be explained by the sac being obliterated below, and the fluid being thus limited to the upper part of the vaginal sac.

small amount of inconvenience attendant on this form of hydrocele, interference is less sought for than in the ordinary hydrocele of the tunica vaginalis. So also, from the slow re-collection of the fluid, simple tapping will often suffice when something requires to be done, and more rigorous steps are contra-indicated, as when the patient has heart disease. The position of the testis should always be first made out. The cyst may usually be tapped on the outer side. If more radical measures are required, the surgeon must choose between injection of iodine or carbolic acid, antiseptic incision or a seton.

In making use of injections, the same precautions are to be used as in the case of the more ordinary hydrocele (p. 141). If the cyst is small and mobile it is especially imperative that the trocar should clearly have entered the cyst. Carbolic acid just liquefied with glycerine (p. 148), or the undiluted tincture of iodine of the Edinburgh or British Pharmacopœia should be used, and a portion left in the sac, the amount of this being proportioned to the original size of the hydrocele.

If the radical treatment by injection be adopted, it is noteworthy that these hydroceles are not thus so readily cured as those of the tunica vaginalis. The reason of this is somewhat obscure, but it has been noted by several writers. Thus, Sir B. Brodie states that he has never known a case in which injection succeeded (*Med. Gaz.* vol. xiii. p. 139). It is, however, to be remembered that Sir B. Brodie used wine, and not iodine. M. Gosselin considered that the failure of injection in these cases may be accounted for by the fact that the inner surface of the cyst not being serous is not as ready as the tunica vaginalis to take on adhesive inflammation. Perhaps the thinness of the walls and their slighter vascularity also help to explain the above. If a seminal duct open into one of these hydroceles, and the degree of inflammation excited by injection be slight, the continuous entrance of spermatozoa may readily keep up the effusion of fluid.

Three cases of radical cure of encysted hydroceles have come under my care, in one of them injection with iodine had previously failed, in each case antiseptic incision was followed by obliteration of the sac. This method is especially indicated where previous treatment has failed, where several cysts co-exist, or where the diagnosis is very obscure. There is greater need of caution if this method be employed than in the case of the ordinary hydrocele, as it cannot be known beforehand whether seminal tubes are spread over the cyst or no (Fig. 30). To make certain of the cure being radical it is well to suture the cut edges of any part of the cyst which cannot be safely removed to those of the skin, and to wipe it over with a stick of silver nitrate or pure carbolic acid.

In one case of encysted hydrocele, apparently situated in the lower part of the cord, just above the right testicle, which had been previously tapped, and found to contain spermatozoa, Mr. Gould (*Lancet*, 1890, vol. i. p. 894) was able to shell the cyst out entire. Where the cyst is small, where it persistently slips away from the fingers, or where the patient refuses incision, two or three silk threads, previously soaked in iodine tincture, may be passed through the sac by the method already given (p. 162). At the close of twenty-four hours they will usually require withdrawal, but if the inflammation be mild they should be left in until the cyst feels solid.

SECTION VII.

HYDROCELE OF A HERNIAL SAC.

This term is used when the sac of a hernia becomes the seat of a serous effusion, after its communication has been cut off by the closure of its neck by adhesions, by a portion of omentum (*vide infra*), or by the long-continued pressure of a truss. An instance of this last cause is given by Mr. Curling, in which two bilateral swellings, of very large size, quite unconnected with the testicle, resulted from the constant wearing of a double truss for a period of thirty-five years. It is a very rare affection.

The fluid is usually clear, straw or amber coloured, serous, resembling that met with in hydroceles of the tunica vaginalis. Owing to the well-known extensibility of the sac of a hernia, large collections of fluid may be met with in these cases. Thus, Mr. Langton has recorded one in which 3½ pints were evacuated. The source of the fluid is chiefly from the vessels of the large and slowly increasing sac, owing to the obstruction which the thin-walled veins meet with at the neck of the sac from the pressure of a truss, the presence of adhesions, &c. That the fluid is not effused from omental vessels seems clear from the fact that, in some cases where a very large effusion has slowly formed in a hernial sac, the neck is merely occupied by a small nodule of omentum.

Hydrocele of the sac is much more common in inguinal than in femoral herniæ, for the same reasons that large inguinal herniæ of eight years' duration. The day before the incarceration he was obliged to make a rapid journey on horseback; his truss broke on the way, and when alighting he found the scrotum of extraordinary size; acute pain in the groin and nausea also came on. The swelling was uniform and smooth over almost its whole surface, and elastic. It resembled a large hydrocele, and might have been taken for one if there had not been evident marks of incarcerated intestine. Scarpa goes on to say: "I could with difficulty persuade myself that this large tumour was formed for the most part by water collected in the vaginal coat of the testicle, as the patient never had the smallest mark of serous effusion in the scrotum, as well because, from the repeated assertion of the patient, the hernia in the course of eight years had never exceeded the size of a hen's egg, and there was no reason to suppose that so much water had descended from the cavity of the abdomen into the scrotum in a young man in other respects very healthy and strong. I rather suspected, considering the fatness of the patient, that, by the exertion of the riding, a great mass of omentum had descended, although there still remained some doubt how, in so short a time, the hernial sac could have yielded to so great a distension, and because the tumour had rather the appearance and elasticity of a large hydrocele* than of a large hernia composed of intestine and omentum." An incision into the sac gave vent to about three pints of yellowish serum. At the upper part was a loop of small intestine, but no omentum. The stricture† was divided and the bowel returned. The patient recovered.

In the following case the effusion was of a chronic kind (Monro *Medical Essays and Observations*, vol. v. p. 314): An old man had long had an irreducible hernia, which reached nearly to his knee He was obliged to keep on his back, lost flesh and strength, and had much pain in the swelling and in the loins. In some places a plain fluctuation was perceived, without any of the unequal solid substances felt everywhere else. One of the fluctuating spots being made prominent, a small trocar was introduced, and six pints‡ of clear serous fluid withdrawn; convolutions of intestine and omentum were then clearly felt: none of them were reducible. The patient was greatly relieved of his pain, and no further operation was thought proper.

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* As Mr. Curling remarks, had Scarpa examined the tumour by transmitted light, he could scarcely have suspected that the bulk of the swelling consisted of omentum.

† This will often seem very high up, in these large swellings.

‡ According to Bouisson, quoted by Curling, 28 pints on one occasion and 45 on another were withdrawn from one of these cases.

The next case was one of so-called spurious hydrocele of the sac of a congenital hernia, and closely resembled a congenital hydrocele (Curling, p. 217). A boy aged twelve had a left scrotal swelling, transparent, reaching upwards into the canal, fluctuating with an impulse on coughing. The left testicle could not be felt. On making gentle pressure the swelling disappeared rather suddenly, and then the testicle could be readily distinguished, and was found to be less than half the size of its fellow. The swelling was stated to have lasted since the boy was two years old. This appeared to be a case of congenital hydrocele, of which it had all the symptoms, except that on pressure the swelling disappeared suddenly instead of gradually. After a truss had been worn for three weeks the fluid was found to have entirely disappeared, and none descended on the removal of the truss. When, however, the boy coughed, a small inguinal hernia descended. It then became clear that this had been a spurious hydrocele of the hernial sac, and thus was explained the only symptom unusual in congenital hydrocele—viz., the *sudden* disappearance of the swelling on pressure—the fluid passing into the abdomen together with the intestine, which it had completely masked from observation.

SECTION VIII.

FIBROUS OR SO-CALLED CARTILAGINOUS BODIES, ATTACHED OR FREE, IN THE CAVITY OF THE TUNICA VAGINALIS.

I prefer the above name to that of "loose," "foreign," or "cartilaginous bodies" often applied to these structures. Thus they are usually attached, not loose. Foreign implies an introduction from without. It will be seen below that I believe the term cartilaginous to be very rarely justified. These are more commonly met with as projections, varying in size and structure, being sometimes cystic, at others solid, attached to the visceral surface of the tunica vaginalis. Much more rarely they are met with free in its cavity. When free, as many as four have been met with: usually there is only one. They are unknown in early life, and are very rare in young subjects.

are much more frequently met with, without strangulation, than femoral.*

Symptoms and **Diagnosis.**—The symptoms are chiefly those of hydrocele occurring at the site of a hernia, usually inguinal, of long standing, and it may be, with the history of a truss worn for many years. Thus the swelling fluctuates, is transparent, and, when of large size, possesses a distinct thrill when percussed. The above, together with the fact that impulse on coughing is but little if at all marked, distinguish this affection from hernia, which it resembles in its position, its extension upwards with a sort of neck, and the fact that it conceals the cord. From ordinary vaginal hydrocele it is distinguished by the same extension upwards and the testicle being more distinct from the swelling. Mr. Curling (*loc. supra cit.*, p. 211) points out that some difficulty might be experienced in diagnosing a small hydrocele of the hernial sac from an encysted hydrocele of the cord. He gives the following aids in the diagnosis :—"Both are distinct from the testicle, and their relative situation and mode of formation are very similar, the only essential difference being that the process of peritonæum in the former had once contained either intestine or omentum. A hydrocele of the hernial sac occurs somewhat later in life, is usually of some considerable size, and its fluid contents are of an amber or dark colour; while an encysted hydrocele of the cord generally appears before puberty, is rather small in size, and contains fluid which is generally colourless, and nearly free from albumen. Attention therefore to these circumstances, but more especially to the history of the case, would leave but little room for doubt."

The following case, which is the only one that I have met with, shows that some of the above points—viz., the age—are not absolutely trustworthy, and it also instances the great difficulty that may be met with in these cases where the history is wanting or unreliable:

E. O., aged nineteen, was admitted under my care into Guy's Hospital, August 14, 1877, with a swelling at the upper part of the left side of his scrotum, situated a little below the external abdominal ring. At this spot some thickening could be detected, and a very indistinct neck could be traced into the canal. The swelling resembles in appearance a small inguinal hernia, but it cannot be reduced, and there is no impulse when the patient coughs. It is translucent. The patient insists that the swelling only appeared about two weeks before, when he was "jumping about." It has not increased since, being now of the size of a Tangerine orange. The swelling was explored by an antiseptic incision, and when the sac was opened a quantity of watery fluid of the same colour and characters as that of the ordinary vaginal hydrocele escaped. The upper end was firmly plugged with omentum, apparently of long standing. This, when unravelled, formed a considerable mass, about two inches long. It was transfixed with chromic gut and cut away: the edges of the sac being stitched with horsehair to those of the skin incision. A month later the patient was discharged with a granulating point the size of a pin's head.

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* Mr. Langton, however, has recorded (*St. Barth. Hosp. Rep.*, vol. x. p. 38) a very interesting case of a large hydrocele of the sac of a femoral hernia, treated successfully by a seton and incision.

Before operation I had diagnosed an encysted hydrocele of the lower part of the cord, explaining the rapid appearance of the swelling by a sudden effusion into some unobliterated portion of the funicular process. It seems now that, this process remaining unobliterated to a point just below the external ring, a portion of omentum had descended a long time before, but had not been noticed by the patient, the fluid perhaps collecting in the portion of the sac below more rapidly than usual.

Treatment.—In most cases, as in the one just given, antiseptic incision should be employed. The after-treatment will be shortened by removing the sac, or as much of it as is possible, taking every precaution with regard to the cord, the steps being much the same as those already fully given at p. 78. As it can never be made out with absolute certainty that the upper aperture is quite closed, injections should not be employed.

Mr. Curling gave the name (not in my opinion altogether well chosen) of "spurious hydrocele of the hernial sac" to those cases of scrotal hernia which are attended with an unusual amount of fluid. This may be formed rapidly or more slowly. Most frequently the formation is acute, and occurs with symptoms of strangulated hernia. Every operating surgeon is familiar with the varieties, both in its quantity and other characters, which the fluid met with in the sac of a strangulated hernia may present.

In the following interesting case of Scarpa's (*Hernia*, translated by Wishart, p. 230) the amount of fluid, which was formed rapidly, was most unusual. A man, aged twenty-five, very fat, had an incarcerated hernia of an enormous size. The hernia was of eight years' duration. The day before the incarceration he was obliged to make a rapid journey on horseback; his truss broke on the way, and when alighting he found the scrotum of extraordinary size; acute pain in the groin and nausea also came on. The swelling was uniform and smooth over almost its whole surface, and elastic. It resembled a large hydrocele, and might have been taken for one if there had not been evident marks of incarcerated intestine. Scarpa goes on to say: "I could with difficulty persuade myself that this large tumour was formed for the most part by water collected in the vaginal coat of the testicle, as the patient never had the smallest mark of serous effusion in the scrotum, as well because, from the repeated assertion of the patient, the hernia in the course of eight years had never exceeded the size of a hen's egg, and there was no reason to suppose that so much water had descended from the cavity of the abdomen into the scrotum in a young man in other respects very healthy and strong. I rather suspected, considering the fatness of the patient, that, by the exertion of the riding, a great mass of omentum had descended, although there still remained some doubt how, in so short a time, the hernial sac could have yielded to so great a distension, and because the tumour had rather the appearance and elasticity of a large hydrocele[*] than of a large hernia composed of intestine and omentum." An incision into the sac gave vent to about three pints of yellowish serum. At the upper part was a loop of small intestine, but no omentum. The stricture[†] was divided and the bowel returned. The patient recovered.

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In their attached state, and this has an important bearing on their origin, they come under two main heads:—(1) The more frequent form is that often to be found between the globus major of the epididymis and the body of the testis. It lies between the visceral layer of the tunica vaginalis and the tunica albuginea, is most frequently pyriform in shape, sometimes sessile, but more often pedunculated. Not unfrequently there is more than one.* Its name, "Hydatid of Morgagni" (*De Sed. et Caus. Morb.*, Ep. 4 and 43), was given it by this most careful observer, the term "hydatid" not here referring to any connection with an entozoon, but being merely used as synonymous with vesicle. More recently, it has been proved to originate in an unobliterated relic of the Müllerian duct (p. 198), and its connection with the encysted hydrocele of the testis has been already considered.

(2) A more irregular variety of projections, usually small and solid, sometimes wart-like, sometimes more leaf-like and pendulous. These may be found, like the projections first described, near the upper junction of the testis and epididymis, and may then originate in the same way; but they are also found irregularly scattered over the visceral tunica vaginalis, and in this case originate not in relics of certain definite fœtal structures, but in previous inflammation starting from without or from the subjacent testis or epididymis, and in either case are insidious and unnoticed by the patient. Sometimes these bodies develop not on the surface of the serous membrane, but in little cysts or cul-de-sacs especially near the hydatid of Morgagni. At others they are found moulded into depressions between the testis and the epididymis (Spn. 246, St. George's Hosp. Mus.). Occasionally this or any other projection on the tunica vaginalis may, when pedunculated † (and the hydatid of Morgagni may have a peduncle almost an inch in length), be a source of irritation to the tunica vaginalis, and

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* Spn. 2754a (St. Barth. Hosp. Mus.) shows part of the sac of a hydrocele in which three nodules in a line were found above the epididymis. Throughout the sac are scattered numerous small hard masses, here and there deep brown in colour; many of these consisted of fibro-cartilage.

† According to MM. Monod and Terrillon these bodies, when detached, often show a sort of hilum or depression, which points to the attachment of their pedicle. Spn. 2754, St. Bartholomew's Hosp. Museum, is an instance of this. It shows a fibro-calcareous body about the size of a pea, found loose in the cavity of the tunica vaginalis of a middle-aged man. On one of its surfaces is a projection apparently part of a pedicle: a small fibrous nodule was found on the surface of the testicle close to the head of the epididymis, which was probably the base of the pedicle.

cause the gradual appearance of a hydrocele, much in the same way as a pedunculated and semi-solid synovial fringe may set up an irritative synovitis. The fluid is usually small in amount, and often absent altogether.

Quite a different and, as far as I know, unique, variety of these bodies, is shown in Spn. No. 125 St. George's Hospital Museum. From the inner surface of the parietal layer of the tunica vaginalis, towards its upper part, but quite away from the testis or epididymis, is an extraordinary pyriform swelling, quite an inch long, attached to the tunica vaginalis by a narrow neck. The walls of this swelling are apparently composed of the same tissues as those of the tunica vaginalis. It was not solid, but contained altered blood and "a small round" body. The specimen is taken from the body of a patient of Sir B. Brodie's, who died of erysipelas after tapping of a hæmatocele of the tunica vaginalis.

The **structure** of these bodies, when solid, is usually fibrous tissue, arranged in concentric lamellæ, amorphous under the microscope, or rich in connective-tissue cells. It is these cells which have been taken for cartilage, but as a rule no cartilage is present. These bodies may be arranged in two groups:—(1) The soft, and often cellular; (2) those much harder. In these calcification is common. In very rare cases they have been described as bony; but these were probably calcified, not ossified.

Origin.—This is twofold. (A) In relics of fœtal tissue already alluded to when the so-called hydatid of Morgagni was considered. (B) In chronic inflammation. This may prove the starting-point of these bodies in two ways: (*a*) by some patch of chronic inflammation on the inner surface of the tunica vaginalis of increasing thickness as it projects inwards, slowly becoming pedunculated and thus detached; (*β*) by the variety of small fibrous projections, warty or leaf-like, mentioned at p. 212, which originate in chronic inflammation as minute papillomata * from the endothelium. The view that these bodies originate in chronic inflammation of the tunica vaginalis derives support from a case examined by M. Duplay,† in which one cartilaginous body was loose in the cavity, and another attached by a filiform pedicle t the head of the epididymis. The fibro-cartilaginous plate thickenings and false membranes, sometimes found to co-exist wit these bodies also supports the above view. In a very few cases, blood clot may have been a source of origin. This blood clot ma sometimes be deposited in the cysts spoken of above.

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* MM. Monod and Terrillon call these papillary vegetations, and compare them to the serous papillomata of the arachnoid.

† *Arch. Gén. de Méd.*, 1855, t. ii. pl. 33. In the Museum at Fort Pitt is a small pedunculated body of an osseous nature attached to the vaginal tunic covering the globus minor. Sir A. Cooper found one of these little bodies pendulous from the internal surface of a cyst between the tunica vaginalis and tunica albuginea. In pl. xiii. fig. 2 of his work one is represented hanging by a pedicle from the caput epididymis.

Symptoms.—These are usually absent. Usually quite smal and liable to be lodged in some cyst or depression, and som times masked by the fluid of a hydrocele, they rarely attra attention. Sir G. Humphry in examining a hydrocele which ha been recently tapped, and which was rather flaccid from the flui not having fully re-collected, felt a firm smooth body slipping abo in the cavity. A small incision was made and a disc extracted large as a bean, polished externally, and composed of compa fibrous layers encircling an earthy nucleus. A hæmatoce followed, with intense pain, rendering it necessary to lay open th tunica vaginalis. The hydrocele was of six months' duration, an had been twice tapped without there being any unusual pain other symptom indicating the presence of a foreign body.

Much more rarely, these bodies give rise to severe sympton after tapping. Thus, in a patient who used to suffer excessive pai as soon as the tapping was over, lying down on the floor ar groaning with agony for a quarter of an hour, Sir B. Brod (*Lond. Med. Gaz.*, vol. xiii.) found a "loose cartilage" after deat in the cavity of the tunica vaginalis.

Chassaignac (*Bull. de la Soc. de Chir.*, 1852, 1^{re} série, t. ii. p 484, 485), in an old man aged sixty-six, detected through th scrotum a body of stony hardness the size of a hazel-nut. Th was removed by incision.

Treatment.—Antiseptic incision and removal.

CHAPTER IV.

HÆMATOCELE.[*]

UNDER this heading the following varieties of effusions of blood in the vicinity of the testicle or cord present themselves for examination:

(i) **Hæmatocele of the Tunica Vaginalis.**
(ii) **Encysted Hæmatocele of the Testis.**
(iii) **Hæmatocele in the Substance of the Testicle. Parenchymatous Hæmatocele.**
(iv) **Hæmatocele of the Epididymis.**
(v) **Combined Abdominal and Scrotal Hæmatocele. Bilocular Hæmatocele.**
(vi) **Hæmatocele of the Cord.**[†]

The first is the one usually seen, and all the other varieties are very rare, those numbered ii. iii. iv. and v. extremely so.

SECTION I.

HÆMATOCELE OF THE TUNICA VAGINALIS.

This, the only form of hæmatocele usually met with, is a rare affection. In the great majority of cases it is traumatic in origin. In fact, by most writers this is the only form of hæmatocele alluded to. Before it is described **two questions** arise for an answer. (A) **Does a hæmatocele ever arise without any violence?** (B) **How far should the origin of a hæmatocele be ascribed to a pathological condition of the tunica vaginalis rather than to injury?**

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[*] French writers, owing to the view which they take of the pathology of hæmatocele, prefer the terms chronic vaginalitis or pachy-vaginalitis. Réclus would abandon the term hæmatocele, as "blood may be wanting in a hæmatocele." He defines pachy-vaginalitis, the term which he prefers, as "an affection characterised by considerable thickening of, and abundant new formation in, the walls of the serous membrane enveloping the spermatic gland." This, it seems to me, is going much too far, as whatever is the correct pathology of hæmatocele—*i.e.*, whether it is primary or secondary to a diseased state of the tunica vaginalis and testis or epididymis—the presence of blood is the characteristic feature, a point which M. Réclus seems to lose sight of in the above definition.

[†] This will be considered separately under Section II. "AFFECTIONS OF THE CORD."

(A) **Does a hæmatocele ever arise spontaneously, without any injury?** Cases occur, though very occasionally, where the patient is positive that he has received no injury, and that the affected side of the scrotum was natural before the onset of the hæmatocele, and where the surgeon can discover neither ecchymosis nor any trace of contusion.

Sir B. Brodie speaks thus of these cases:—"At other times, but more rarely, a hæmatocele occurs without any evident cause. I suppose it is in this case to be attributed to a diseased state of the blood-vessels. Extravasation of blood within the cranium very rarely takes place independently of mechanical injury, except the blood-vessels are diseased; and the same diseased state of the vessels which makes them liable to give way in the brain, makes them liable to give way in other parts of the body. Persons who have diseased vessels frequently have extravasation of blood into the cellular membrane of the legs or thighs, forming afterwards collections of fluid resembling coffee-grounds, and it is reasonable to suppose that under the same circumstances blood may be effused from the vessels of the testicle."

The following case (Dr. Svalin, *Hygiea*, Août 1845) bears on this matter of spontaneous hæmatocele. A man, aged forty-five, coughing violently while at stool, "éprouva une sensation comme si quelque chose tombait brusquement dans le scrotum." The left side of the scrotum immediately became swollen, bluish and painful; upon incision, a large ecchymosis was found in the scrotum and a clot the size of two eggs in the tunica vaginalis. A vessel which was seen to be bleeding near the head of the epididymis was tied, and the case did well.

(B) **How far should the origin of a hæmatocele be ascribed to a pathological condition of the tunica vaginalis rather than to injury?**

We here come to a very vexed question in the causation of hæmatocele. In this country it has been held that nearly all hæmatocles date to some form of injury. And I must say that the clinical history of cases strongly bears this out. In France, however, most writers have followed M. Gosselin, who in 1851 published (*Arch. Gén. de Méd.*, 1851, t. xxvii. pp. 5 and 95) his view, that for injury to play any part in the causation of hæmatocele the tunica vaginalis must first be in a diseased condition, this pathological state preparing it as it were for the action of the injury. In other words, he considered that the effusion of blood is not the first step; that the tunica vaginalis is not normal, to begin with, in these cases, but that before the onset of hæmatocele it is the seat of false membranes. It is these membranes, aided by an injury, which produce the effusion of blood.

M. Gosselin based this view on the following reasoning. He held that it is very rare to find in any subject, at all advanced in life, a tunica vaginalis without some partial adhesions or thin false membranes.

In support of this belief that slight, and at the time often unperceived, inflammation, is the first step in the formation of a hæmatocele, by the false membranes which it produces, M. Gosselin alluded to the great frequency with which similar results are met with in other serous membranes—*e.g.*, pleura, peritonæum and pericardium. Now the tunica vaginalis is the least protected of all the serous membranes; it is the most exposed to friction, blows and squeezes, and thus is especially liable to inflammation. Inflammation of the tunica vaginalis, and the consequent production of false membranes, has perhaps been less observed here than in the case of other serous membranes, owing to the fact that the much smaller extent of this serous membrane, and its not being in relation with any vital organ, renders inflammation of it a matter of much less gravity. M. Gosselin considered that the starting-point of the false membrane is a slow and insidious inflammation leading to exudation of plastic material. According to him, the causes of this pseudo-membranous change include everything which can give rise to chronic and insidious thickening of the tunica vaginalis. Sometimes the disease arises spontaneously, at others it is due to chronic epididymitis or orchitis; sometimes the injection of a hydrocele or a contusion, especially one often repeated, as in riding, is the starting-point.

M. Réclus (who holds very strongly the view that a hæmatocele—or, as he would prefer to call it, a pachy-vaginalitis—is always a secondary affection, preceded and brought about by some alteration latent or declared, of the seminal gland) believes that scrotal hernias incontestably predispose to hæmatoceles. He bases this belief on the fact that out of forty-seven cases a hernia co-existed in nearly one-third, and was always on the same side as the hæmatocele. He believes that irritations of the hernial sac must spread to the contiguous tunica vaginalis, thus leading to the formation of false membranes. The fact must not be lost sight of that, owing to the presence of a scrotal hernia, the testicle and tunica vaginalis must be more exposed to injury. M. Réclus also considers syphilis of the testicle and epididymis as predisposing to hæmatocele, by the production of "sclero-gummatous" thickening of the two layers of the serous membrane which the above disease may bring about. M. Réclus thus explains the stages by which disease of the testicle and epididymis may produce false membranes. Inflammation of the gland or the epididymis leads to congestion, extravasations, and escape of leucocytes and fibrinous exudation. These accumulate, especially where the visceral lymphatics are the most abundant, and, as a general rule, in proportion as the connection between the visceral and subserous lymphatics is the more direct, so more quickly and more intensely will the tunica vaginalis itself be affected. This, M. Réclus thinks, explains a remarkable fact—viz., the abundance of the false membranes about the epididymis, and their absence or extreme delicacy over the testicle. The lymphatics of the testis and the tunica albuginea have no connection with those of the tunica vaginalis. Both converge towards the epididymis, and join here. Thus the serous membrane over the testis, isolated as this organ is by the tunica albuginea, as it were by a carapace, shows very few false membranes. With the epididymis the state of things is very different, the cellular tissue over this organ gives it but a feeble protection and isolation, and thus inflammations from it readily reach the overlying serous membrane. In addition to the above, the epididymis is very vascular, it is the centre of the radiation of the arteries, it is the point to which the veins converge, to its lymphatics are joined those of the testicle. All the above points explain how readily inflammation of the epididymis, reaching it from the urethra, &c., affects the serous membrane over it, and thus produces false membranes here.

I have given the above view of M. Gosselin, and other chief French writers at length, on account of the respect which attaches to their opinions. To me the view appears to be ill-supported by pathological evidence, and to be quite opposed by the clinical history of cases of hæmatocele. Many of the above writers seem to me to argue from incorrect premises, and their conclusions therefore to be unreliable. Thus MM. Monod and Terrillon put forward the frequency of inflammations of serous membranes generally, the resulting false membranes gradually thickening and becoming vascular. The walls of the new vessels which traverse these false membranes are, they argue, of embryonic tissue, and therefore easily ruptured. The slightest cause, sometimes even a mere congestion, will suffice to bring about this rupture. A hæmorrhage thus determined, if slight, will only show itself as small foci in the thickness of the exudation; if larger, it will accumulate in the serous cavity. In this way hæmorrhagic pleurisy, pericarditis, peritonitis, and meningitis are brought about. Finally, they state that the tunica vaginalis does not escape this law, and thus would prefer, were it not for the sake of conforming to general usage, to employ the term chronic hæmorrhagic vaginalitis rather than hæmatocele.

Now, up to a certain point, but no farther, all will agree with the above. The liability of serous membranes generally to formation of false membranes, and the existence in these *for a time* of delicate new vessels, is notorious. But it is surely equally recognised that this vascularity is only temporary, that after a time as the lymph of which these false membranes first consist becomes more highly organised its vessels begin to waste and disappear, until the false membrane, when ultimately developed, is a tissue of very low vascularity. Were it not so, hæmorrhage into serous cavities would be much more frequent than it is. We meet with pleuritic, peritonæal, and pericardial effusions commonly enough, but these are serous or purulent; blood in such effusions, apart from injury or the presence of malignant growth, is extremely rare. A theory of the causation of hæmatocele which takes for granted that these vessels persist must, I think, fall to pieces.

I have said above that serous membranes *generally* are liable to the formation of false membranes. But the tunica vaginalis would appear to be an exception to the rule. Apart from inflammation extending to it from the testis or epididymis, we rarely meet with anything that may be called a vaginalitis. This is due in great measure to its small size, its mobility and its protection from injury or exposure to cold.

I am aware that I am here opposed to good authorities, but I appeal for the correctness of my statement to the following points:

If, like its fellow serous membranes, the tunica vaginalis were liable to slight inflammations and the formation of false membranes, would not patients—considering the exquisite sensitiveness of the organ—more frequently apply to us for advice and relief? They do so at once when pains tell of the formation of similar false membranes in other serous membranes—*e.g.*, pericardium and pleura—and we are then consulted quickly enough; but if, as French writers hold, the tunica vaginalis is no exception, it is, to say the least of it, extraordinary that symptoms are so entirely absent. But passing from hypotheses to facts, morbid anatomy shows that this serous membrane is an exception as regards its liability to the formation of false membranes. When teaching Operative Surgery some years ago, I made a rule of examining the testicles when removed by castration. In not one of 66 specimens removed from the bodies of elderly men did I find anything in the least approaching to the formation of false membranes in layers of varying thickness, that has been described as constant by those writers who hold that an abnormal condition of the tunica vaginalis precedes the formation of a hæmatocele. Yet these testicles were removed from the bodies of the very poor, who must have been exposed throughout life to all the conditions which would predispose to the formation of such membranes. As a rule, the surfaces of the tunica vaginalis were smooth and healthy, in a few some adhesions existed, usually delicate and filmy, but always evascular. I have since examined twenty-four other testicles with a very similar result; but perhaps less weight must be laid on this as these were removed from adults at all ages, young as well as old. The same result was present in the 18 cases in which I have opened the tunica vaginalis as part of the method of radical cure by antiseptic incision and partial excision of the sac. Many of these had been repeatedly tapped, and 3 injected with the Edinburgh tincture of iodine; even in these, nothing was found beyond some scattered adhesions and partial obliteration of the digital pouch; when the fluid had escaped, the serous membrane which came into view was usually smooth and glistening over its whole extent. If the tunica vaginalis were as liable as the above-mentioned writers would have us believe to the formation of false membranes, would radical cure of hydrocele be so uncertain and difficult of attainment as in many instances is notoriously the case? And should we find what we do in the hosts of cases who come to us repeatedly for palliative tappings—viz., a testis with its visceral layer somewhat thickened but still mobile and gliding freely within the parietal layer, the serous membrane having all its attributes practically untouched. Again, if hydrocele and hæmatocele were always due to some previously existing mischief in the testis or epididymis causing a vaginalitis, would not the evidence of the inflammation of the tunica vaginalis be found especially and prominently upon its visceral layer? Now this is not the case. False membranes, *when present*, are always of greater thickness over the parietal than the visceral layer (*vide infra* p. 223). Let us turn now to two clinical points in the history of hæmatocele. Hæmatocele is a rare disorder. Would it not be infinitely more common, especially after tapping for hydrocele, if the tunica vaginalis were so liable to the presence of false membranes? So, too, if hæmatoceles commonly originated in false membranes, would not this disease be very liable to follow the injection of hydroceles with iodine or carbolic acid—a sequence which notoriously does not take place? Finally, when patients come for treatment for hæmatocele, the history they give is not, as a rule, one of slow gradual enlargement, arising spontaneously from some leakage from a vascular false membrane, or dating to some slight injury, but of sudden onset and a definite severe injury, or else of tapping.

It is right to add that the question of the *age* at which hæmatoceles chiefly occur supports, in a measure, the view held by many French writers that hæmatoceles are always secondary to thickenings of the tunica vaginalis started by disease of the testis and epididymis. Thus, hæmatocele is practically unknown in early life. Réclus out of 47 cases only found 5 which had started before the age of twelve. Kocher in 48 cases only found 4 in patients under twenty. On the other hand, it is a disease the frequency of which increases as age advances, and the tunica vaginalis may be expected to become less sound. Thus Kocher in 48 cases found that 33 had passed forty. But on this point attention may be called to the fact that as age advances the frequency of hydroceles predisposing to hæmatoceles in more ways than one increases also (p. 227).

Interior of a Hæmatocele. This will include a notice of the walls, the contents, and of the condition of the testicle. The state of all these will vary much, according to the duration of the disease and the amount of irritation to which it has been subjected.

(A) **The Walls.**—When a hæmatocele of long-standing is incised, these are often found strikingly thickened. This is due chiefly to thickening of the parietal layer of the tunica vaginalis, and also, in some cases, to the formation of false membranes. I say advisedly "in some cases," because the tendency of many French writers to teach that these false membranes are constantly present,* and that to their presence especially is due the thickening of the tunica vaginalis, is I consider a mistake, and one that has helped to lead to incorrect views in the pathology of these affections.

Owing to the irritation of the effused blood acting as a foreign body, and in some cases—but I think the minority—to pre-existing disease of the testis, epididymis and tunica vaginalis, the last becomes the seat of chronic inflammation, and so of fibrous thickening, often rendering it as much as half an inch in diameter, from proliferation and gradual sclerosis of the connective tissue.† This fibrous thickening may in places become cartilaginous or even calcareous.

In other cases, the thickening of the sac is due to the presence of false membranes originating in lymph effused from the inner surface of the serous membranes. The structure of these varies from a greyish, succulent, semi-translucent, fibrinous structure ‡ to well-organised connective tissue, which may also undergo further changes in the direction of the formation of plates of cartilage or calcareous tissue. The following points are of practical importance with regard to these false membranes. They add, by their evascularity and denseness, to the risk of sloughing and poor repair of old hæmatoceles. They are sometimes so intimately blended with the tunica vaginalis, that in the treatment by decortication (p. 238) the layer removed may include not only the false membranes but the parietal layer of the tunica vaginalis also. Such a case is mentioned by MM. Monod and Terrillon (*loc. supra*

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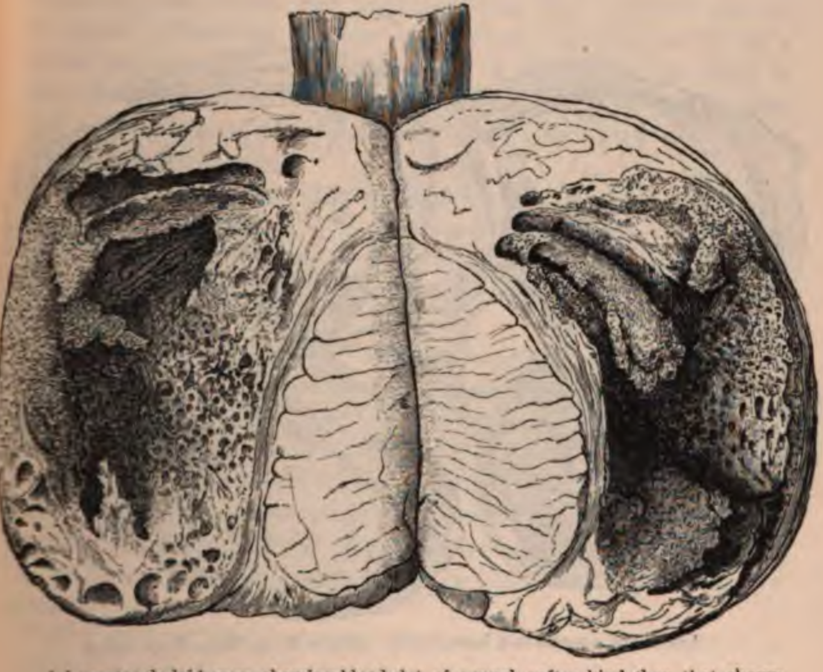
* M. Gosselin would classify hæmatoceles into three groups, according to the thickness and consistency of these false membranes :—(1) Those in which the tunica vaginalis is not much thickened, simply more vascular than normal, and any false membranes present are but slightly adherent. The sac readily collapses after evacuation of its contents. (2) The tunica vaginalis and its contents form a much thicker, rigid sac, which collapses but slightly. (3) Very old hæmatoceles, in which the sac has the appearance of fibro-cartilage, and, later still, calcification having taken place, of a bony shell. Another and more common sub-variety in old hæmatoceles is a sac with islands of fibro-cartilaginous and calcareous material.

† Through the stages of "indifferent" cells, vascular embryonic tissue, and then true connective tissue gradually becoming denser and more and more evascular. The character of the walls of an old hæmatocele accounts for its tendency to slough, especially when septic suppuration has set in, and its poor reparative power.

‡ In this early stage blood-vessels, especially capillaries, are present, and according to Réclus of enormous size. Their walls are very fragile and thus rupture easily.

cit. p. 264) as having occurred to one of them. Again, these false membranes are always of greater thickness over the parietal than the visceral layer of the tunica vaginalis; over the testis and epididymis they are thin, and only detachable in small bits and not in a continuous layer: sometimes they are here absent altogether. At first thin and supple, easily removed with the finger-nail, they later on become more dense, more resisting and inflexible, and render the walls of the sac utterly incapable of any retraction or falling-in when incised. Their colour corresponds in tint to that of the contained fluid, being reddish-brown, or even black.

FIG. 37.

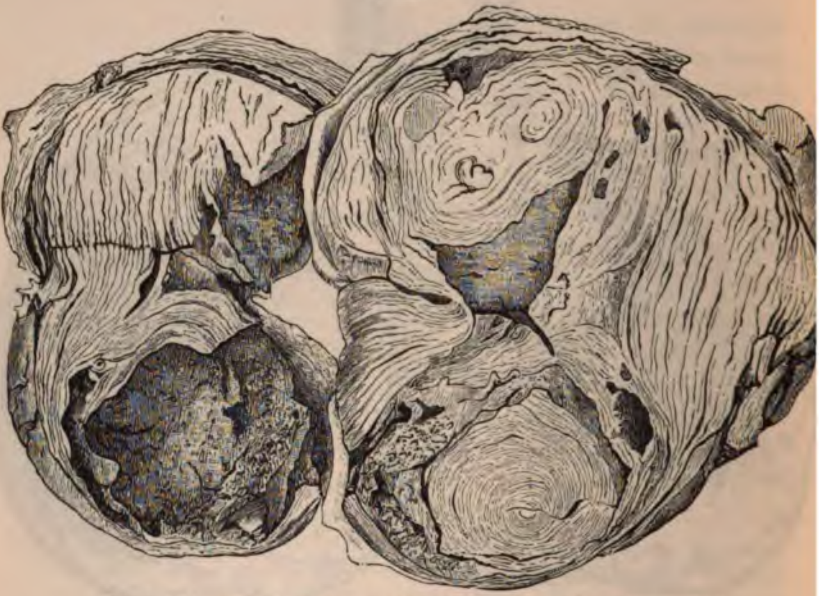


A hæmatocele laid open, showing blood clot of a much softer kind than that shown in the following figure. Towards the centre it is especially soft and granular. The testis appears healthy. (St. Barth. Hosp. Mus. Ser. xxxvi. Prep. 2744.)

Another practical point is, that if localised coagula, or limited heaping up and thickening have taken place in the outer layers of these false membranes, the swelling may present, especially in old cases, a knotty irregular aspect and feel, thus obscuring the diagnosis.

The Blood and Contents of Hæmatoceles.—These vary with the duration of the affection, the date at which the blood escaped, and the freedom with which it was poured out, and, lastly, the extent to which absorption has taken place. Usually fluid as well as clotted blood is present. The fluid will vary from a rosy or deeper red tint in recent cases, to a chocolate brown: or in long-standing cases it has a thick and greasy consistence like treacle. In these cases cholesterin crystals may be present in large amount. Where a thick and altered fluid is present in a much thickened sac, diagnosis is of the greatest difficulty. Microscopically, according to the date of the hæmorrhage, altered and granular red blood discs, their colouring matter presenting itself as pigment or hæmatoidin crystals, degenerated epithelium, fatty matter, and crystals of cholesterin will be present in varying amount. The clots, which are usually present in addition to liquid contents, are met with in different forms; they may be free and floating in a bloody fluid, or adherent to the walls of the cavity. The two Figures (37, 38) show two very different ways in which clots may present themselves in a hæmatocele. That shown in Fig. 37, is

FIG. 38.



Laminated coagula in a hæmatocele. (Guy's Hosp. Mus., Prep. 2384.)

much the most common. Here the effusion has taken place rapidly, the blood clot is softer, entirely devoid of lamination and altogether more of the "passive" kind. The most recently clotted blood is of varying shades of red, the earlier more completely decoloured or of a buff or yellow tint and lining the inner surface of the parietal tunica vaginalis with an irregular layer. In some places these clots are caverned out into cystic honeycomb-like spaces which are filled with a bloody or serous fluid. Fig. 38 shows a rarer condition. Here the blood has escaped slowly into the cavity of the tunica vaginalis, and nearly all the clot is laminated, firm, fibrous and pale, recalling the "active" clot of M. Broca. When the effusion takes place into the cavity of a tunica vaginalis already occupied by a hydrocele, the fluid is often clear and a light bright red, with masses of fresh clot floating in it. The presence of gas has, very rarely, been met with in the cavity of a hæmatocele.*

MM. Monod and Terrillon draw attention to a point which is noteworthy. Occasionally in a hydrocele the fluid of which is thick and scanty, fibrin is present in the shape of long fibrillæ which can be drawn out, and, on superficial examination, resemble seminal tubules.

Site † and Condition of the Testis.—The testis is usually at the posterior and lower part of the hæmatocele. Owing to the absence of translucency, its position is best made out in comparatively recent cases by pressure. But where, in addition to containing many clots, the tunica vaginalis is extremely thickened,‡ where the whole swelling is tender and inflamed, or the patient timid and nervous, the position of the testicle is only to be made out in the course of an incision carefully and slowly made.

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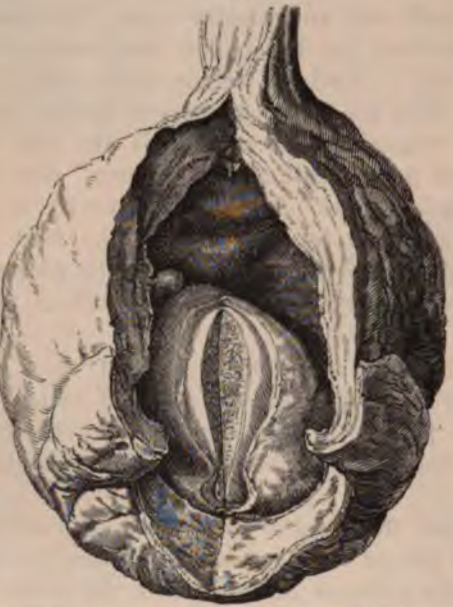
* C. M. Allin (*Amer. Journ. Med. Sci.*, Jan. 1866) records such a case.

† To show the extreme difficulty which may sometimes be met with in defining beforehand the position of the testicle, Mr. Curling mentions two cases in which an inverted testicle was wounded by the free incision made in opening the hæmatocele. I have mentioned a similar case in which the testicle was bisected by a similar slashing incision.

‡ Where false membranes have been freely formed, the epididymis will be thickened and hidden owing to the tendency of these to form about the epididymis and its *cul de sac*, from the large amount of loose connective tissue here. The anterior border and sides of the testis will be comparatively free of these, but owing to the surrounding clots and the alterations in the tunica vaginalis, any projection which it may make will be very different to what we meet with in a hydrocele.

Condition of the Testicle.—As long as the tunica vaginalis is not much thickened the function of the testicle is probably recoverable: it will be smaller, more flabby and less vascular, but there is no irrecoverable degeneration even in large hæmatoceles (Fig. 39) if the coats are not much altered. But in long-standing cases where the tunica vaginalis is much thickened,* the testis undergoes fibrous and fatty degeneration. This is brought about by a sclerosis or thickening and contraction of the tunica albuginea, the supporting connective tissue of the testicle which is given off by the inner surface of this tunic is next altered in the same way, and atrophy of the tubes and fatty changes in their epithelium are the inevitable result.†

FIG. 39.



Large hæmatocele, with the sac of testicle laid open. The swelling had existed for many years, and was removed by operation in the belief it was a solid enlargement of the testicle. The tunica vaginalis was half an inch thick, and full of a soft, pliable, chocolate-coloured substance. The testicle was somewhat flattened, but perfectly healthy in its glandular tissue, and its bulk scarcely below normal. It is not stated whether spermatozoa were present. (Curling.)

In advanced cases of this kind the testicle is so altered and diminished in size that it can only be found, after opening the sac, with the greatest difficulty. Sir B. Brodie mentions one case

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* Thus, if after antiseptic exploration "decortication" (p. 238) can be successfully performed, the testis may be retained and useful.

† Sir B. Brodie mentioned (*Lond. Med. and Phys. Journ.*, vol. lviii. p. 299) two cases of old hæmatocele in which no vestige of the substance of the testicle remained. Kocher has also recorded two cases, and M. Pilliet (*Compt. rend. de la Soc. de Biol.* 1887, t. iv. p. 324) three more fully. Velpeau incised an old hæmatocele, and hunted for the testicle fruitlessly. The patient died, and the organ was found in the midst of masses of false membrane, but spread out and membraniform.

(*Lond. Med. Gaz.*, vol. xiii. p. 380) in which the testicle had almost entirely disappeared.

Causes.—I have already given fully my reasons for considering that hæmatocele is nearly always traumatic in origin, and that the theory of leakage from vessels in false membranes cannot be sustained as a frequent cause. Hæmatocele is usually, in this country certainly, traumatic, and presents itself under *two chief conditions*, viz.: (A) *In combination with hydrocele.* (B) *Independent of hydrocele.*

(A) **In Combination with Hydrocele.**—Hæmatocele of the tunica vaginalis occurs not infrequently in combination with a hydrocele, and that in *three ways*—(1) *It may occur after tapping a hydrocele, and directly in consequence of it.* Thus, it may be occasioned by the puncture of a small vessel on the parietal portion of the tunica vaginalis which happens to lie in the course of the trocar, more rarely from fracture of the testis itself.* It is especially likely to follow on the use of a lancet or needlessly large trocar, or when any hitch is felt on introducing the trocar, owing to the shoulder of the cannula not fitting well or to the patient making a sudden move. Under the latter circumstances, a sudden plunge or darting forward of the trocar is only too probable, resulting in a wound of the testis or of the opposite surface of the tunica vaginalis. The nature of the incident may be sometimes recognised by the escape of blood which takes place from the cannula on the withdrawal of the trocar, by which the hydrocele fluid is more or less deeply tinged. But more often no outward symptom is noticed at the time; the side of the scrotum which corresponds to the hydrocele being found to become larger within an interval which varies considerably according to the rate at which the blood escapes, the movements of the patient, and so on.

(2) In a few cases a hæmatocele of the tunica vaginalis may occur *after tapping, but not in consequence of this, save indirectly.* This extravasation of blood from weakened veins of the tunica vaginalis may follow on withdrawal of the hydrocele fluid, which has previously afforded support to these weakened vessels. Here

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* Mr. Curling mentions the case of a man who was the subject of a hydrocele which had been tapped by a surgeon. The swelling returning, the man punctured himself with a penknife without ill effects. On his repeating the operation later he was not so fortunate, as a hæmatocele followed. Sir W. Fergusson (*Lond. and Edin. Month. Journ. Med. Sci.*, July, 1843) treated a hæmatocele by incision in the case of a gentleman who was in the habit of performing acupuncture for his hydroceles, and who left a needle in the sac.

the hydrocele fills up again, at once tense and perhaps ecchymosed, and if the tapping is repeated blood spirts from the trocar.

(3) A hæmatocele may occur *in combination with a hydrocele* in another way, *but entirely independently of any tapping*. Owing to the distension of the tunica vaginalis with fluid it becomes more voluminous, more resisting, less movable, and therefore less able to evade violence and injury. In such cases a patient may have his hydrocele converted into a hæmatocele by a blow against the pommel of a saddle or by falling against a chair. Here the accident may be aided by a senile state of the vessels, as in two interesting cases reported by Dr. Paton (*Lancet*, 1883, vol. ii. p. 1040). In one the patient was aged sixty, who appeared to have had a hydrocele about forty years. When about fifty-eight he got drunk one evening, and in the morning found his scrotum distended, discoloured, and painful, but whether he had been hurt by a fall or a blow he could not say. The swelling was not transparent, and fluctuation was so indistinct that a Southey's tube was introduced, giving vent to porter-coloured fluid, rich in cholesterine. Castration was performed, and the patient recovered. The second patient was aged sixty-six, and had had a hydrocele nine or ten years. One day he slipped and squeezed his hydrocele, acute pain and discoloration of the scrotum following at once. Incision was here performed successfully. In both cases a sphygmographic tracing was distinctly senile.

(B) **Traumatic Hæmatocele occurring without any Combination with a Hydrocele.**—This is a rare form of hydrocele, owing to the protected position of the testicle, its free mobility, &c. It occurs when the testicle is struck against a pommel of the saddle, or when the patient, entering a dark room, strikes against an unsuspected piece of furniture. The largest hæmatocele I have seen was in a patient who, while working in the Woolwich Arsenal, received a blow from a slowly swinging piece of metal. This produced an enormous collection of blood, both extra- and intravaginal. The patient, a healthy man of middle life, made a good recovery with palliative treatment. In a case of Mr. Curling's, the patient, aged thirty, carrying a large tin basin in his hands, ran against a post, when the sharp edge of the basin struck him on the upper part of the scrotum on the right side. A hæmatocele followed at once. In this case, also, the patient, seeking treatment quickly, palliative measures were successful. In other cases, blows as from a fist, a kick from a horse, a sudden squeeze from crossing the legs, have been causes.

M. Réclus, a well-known authority on diseases of the testicle, and a strong supporter of the origin of nearly all hæmatoceles in "pre-existing pachyvaginalitis," still allows (*Dict. Encycl. des Sci. Méd.*, t. xiii. p. 10) that injury may be a cause of origin. "Certainly, traumatism plays an important part in the production of hæmatoceles, but there are many which arise and develop insidiously, the patient having no recollection of any injury. Nearly a third of our cases belong to this category, and further, amongst those who refer their trouble to some effort or blow, we suspect that frequently this injury has led to a careful examination of the gland, when an already existing swelling has been found, the size of which suddenly increased."

In another class of case the hæmatocele comes on after violent and rare straining efforts, as in lifting heavy weights. The occurrence of a strain must always be remembered in so-called spontaneous cases, together with the possibility of varicose veins or atheromatous vessels.

Yet another class of hæmatoceles, a very small one, but always to be thought of, on account of its exceeding rarity, is where this affection is associated with malignant disease of the testicle. Instances of this are given at p. 233.

Kocher gives another instance of hæmatocele which originated in a sudden effort. A lieutenant, at the word of command, "March," started forwards, and immediately felt an acute pain in the scrotum; this swelled up and became black. Two wine-glasses of black blood were withdrawn from the tunica vaginalis. The following explanation, ingenious but far-fetched, is suggested of the way in which, during a violent effort, the blood, for a moment retained in the abdominal vessels, may rupture one near the groin, make its way into the cellular tissue of the cord, spread beneath the tunica vaginalis, rupture this, and thus present itself as an intra-vaginal collection. If on the dead subject a cannula is introduced into the vas deferens and gelatine injected, it produces a swelling the size of a fist, which partly conceals the testicle. The injection is found to have penetrated into the cellular tissue which covers the epididymis, and shows itself at the posterior border of the testicle. At this spot the tunica vaginalis, raised by the injection, is found much stretched, and presents numerous fissures, through which the injection has filtered into the cavity of the tunica vaginalis.

Where in traumatic cases the collection of blood is large in amount and rapid in effusion, a rupture of the tunica vaginalis may have taken place.

In the following case the conversion of a hydrocele into a hæmatocele was thought to have followed straining (Royes Bell, *Encycl. of Surg.*, vol. vi. p. 577). The patient, aged fifty-two, had had a right-sided scrotal swelling, quite painless, for one year. Three days before admission, after wheeling a heavy truck during the afternoon, he went to bed, apparently quite well, but awaking in the middle of the night with the sensation of something having dropped in the scrotum, he found that his hydrocele had increased twofold, and was very painful. The right half of the scrotum, as large as a cocoa-nut, was red and œdematous. The swelling was heavy and elastic, distinctly fluctuating. The testis could be felt below and behind. On incision, after blood-clots and newly formed lymph had been turned out, a rent was found in the thickened tunica vaginalis, which was opaque like ground glass. A good recovery followed.

Sir A. Cooper, on incising a hydrocele which had been suddenly converted into a hæmatocele by a blow, found a rent in the tunica vaginalis about two inches long and covered with coagulum. In one case of hæmatocele due to the trocar or lancet being used too deeply in tapping a hydrocele, a branch of the spermatic artery was found bleeding when the tunica vaginalis was laid open.

Symptoms.—In traumatic cases these are often well marked. The most reliable are rapid onset of a swelling, limited to the scrotum, after some blow or tapping a hydrocele, the swelling being first fluid and fluctuating, then more or less solid, with points of fluctuation and ecchymosis of the scrotum. Translucency is absent, and tapping is followed by an escape of blood, which at an early period of the case diminishes the size of the swelling considerably. The symptoms vary according to the date at which the hæmatocele is seen. In most cases, especially where there has been a blow, the enlargement of the affected side of the scrotum into a pyriform or oval, tense, indistinctly fluctuating swelling is rapid, is accompanied by discoloration of the scrotum from ecchymosis or suggillation, the patient being conscious of a sensation of rapidly increasing tension. These symptoms will be more marked in the plethoric, and after an injury which is likely to set up rapid inflammation of the part. In such a case, especially if the patient has lived recklessly, has been addicted to drinking, or has insisted on getting about, the above symptoms may be quickly followed by inflammation, suppuration and sloughing; the scrotum, at first purplish and cold, becoming red and hot, and later œdematous and dusky. Save in old cases the position of the testule can often be made out by pressure, and the cord is not enlarged.

Where a hæmatocele occurs after the tapping of the hydrocele (p. 227), the fluid that is withdrawn may be bloody and give warning of the result. In either case the swelling quickly returns, but is heavier, fluctuates less distinctly, and is accompanied by more discomfort or even pain. Here, too, inflammation may follow.

In a third and very important class of cases, the onset of the hæmatocele is very slow and insidious, and the swelling continuing indolent, may be very difficult of diagnosis.

This variety suggests small and repeated bleedings into the cavity of the tunica vaginalis, the gradual conversion of a hydrocele into a hæmatocele, or a spontaneous origin (p. 216).

The symptoms here are very different to those above given. But while all are of importance, while none should be neglected, there is not one which may not be modified. The swelling is pyriform and is rounded, of the size of a turkey's egg.* The overlying skin is normal, and merely somewhat stretched. The surface of the swelling is usually smooth, less commonly it presents elevations, perhaps bossy. It is resisting, but to pressure the swelling is elastic. In some cases palpation only detects softer and yielding spots in a few places. The feel is that of calcareous plates, of lumpy nodules, and in a few cases only a parchment-like crackling is detected. In fewer still palpation detects a wooden or stony hardness. Translucency is absent, and while the position of the testicle is always to be made out, if possible, by pressure, the degeneration which it may have undergone, the thick layer of old clots or false membrane which may surround it, its blunted or abolished sensibility may render detection of the testicle impossible (*vide* foot-note, p. 226). Tapping will give vent to a liquid of varying shades of red, brown, chocolate, or black. The extent to which the cavity collapses varies much, while the above-mentioned characters of the walls are now made out more easily. Save for dragging weight in the groin and loin, pain is usually absent. The patient states that the swelling began slowly and insidiously; very often he professes entire ignorance of its origin, or makes misleading statements. The process is slow, perhaps lasting for years without giving much trouble. If inflammation supervene it runs the same course, and exposes the patient to the same perils which have been given at p. 137.

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* This is merely given as an average size of those hæmatoceles which develop as they originated, insidiously. Such hæmatoceles may be very large, or as small as an orange. As a rule, huge hæmatoceles—*i.e.*, those described as being "as large as an adult head"—are due to an injury, or are hydro-hæmatoceles.

Course and Complications.—It may save many mistakes if attention is drawn to the fact that all hæmatoceles do not follow the course so rigidly laid down, as a rule, by the text-books. While usually sudden in onset, and rapid in their course, they may be insidious and indolent throughout, taking many months and years in reaching any marked size. In another class the swelling proceeds by occasional increases at long intervals. The less rapid the course the more marked will be the thickening of the walls of the sac, and the greater the difficulty of diagnosis, especially when the hæmatocele is seen late for the first time.

The chief complication of hæmatocele is (1) **inflammation** and suppuration. This may be acute, or more chronic, in its course. In the former case, as after a blow or puncture, the swelling becomes increasingly red, tense, tender, and painful. Sometimes the suppuration is due to the unhealthy general condition or irregular life of the patient; in others the cause is quite unknown. The usual evidence of general pyrexia follows, the pain becomes throbbing and the swelling exquisitely tender. At the end of a week or ten days from the commencement, the scrotal tunics project at one spot and are here of a dusky violet purple, and may become gangrenous If now the surgeon interfere, or the swelling is left to open spontaneously, blood-stained pus and foul clots escape. Where the swelling has been left to point and open, the opening is insufficient, and all the symptoms of septic poisoning are very likely to follow. The same grave risk is very likely to follow where a hæmatocele is treated by puncture only, unless the strictest precautions are taken to preserve asepsis, such as irrigation with mercury perchloride solution, the use of an absolutely clean trocar, sealing the puncture with collodion and iodoform, and afterwards, absolute rest. As M. Réclus (*Dict. Encycl. des Sci. Méd.*, t. xiii. p. 18) points out, this is a region in which, from the proximity of the anus and urethra, it is not easy to maintain cleanliness, while the possible existence of false membranes with soft and fragile vessels predispose to septic absorption. (2) **Persistent swelling** due to pachyvaginalitis, and, perhaps, periorchitis also. Where the inflammation is less acute, the mischief subsides after a few days, leaving a swelling dense and resisting, owing to the blood-clots that remain and the thickening of the coverings which enclose them. Complete and permanent resolution of a hæmatocele does not occur. (3) **Fistulous Opening after Incision or Tapping.** M. Réclus gives the case of an old man, aged sixty, whose large and long-standing hæmatocele was tapped and washed out with carbolic-acid solution. The next day acute inflammation set in. An incision gave vent to fetid clots and gas. The tunica vaginalis being calcified the anterior portion was removed. For some days calcareous fragments came away. Five months later similar plates could still be felt in the scar, and a fistula persisted where the trocar had passed through the altered tunics. (4) **Subcutaneous Rupture.** This may occur with a hæmatocele as in the case of a hydrocele (p. 131). When the violence which brings it about is slight, MM. Monod and Terrillon (*loc. supra cit.*, p. 280) suggest that some of the small effusions of blood which sometimes form in the tissue of the tunica vaginalis, giving rise to bossy irregularities on its surface, have predisposed to this accident by weakening the wall that contains the blood. (5) **Association of Hæmatocele with Malignant Disease of the Testicle.** Desgranges and Kocher (*loc. supra cit.*, s. 154) have recorded cases in which a hæmatocele appeared to degenerate into a sarcoma. After incision of the tunica vaginalis the wound did not close, but gave rise to a fungating growth which grew rapidly. In the case of Desgranges the growth quickly invaded the abdomen and proved fatal. In Kocher's case castration seemed to save the patient. In both the instances the hæmatocele was secondary to a growth of the testicle. Mr. Makuna records a case (*Brit. Med. Journ.*, i. 1891, pp. 994, 1319), in which the sac of an apparent hæmatocele was incised, a few days later clots re-collected, these were again removed and attempts made to check the oozing by lint dipped in ferr. perch. This being of no avail, castration was performed, the testicle being found sarcomatous and full of clots, but the cord healthy. A complete but temporary recovery followed. Within two months the sarcoma reappeared in the scar, this was removed, but the patient, aged twenty-three, died rapidly, with extension to the lumbar glands.

Specimen No. 2796A in St. Bartholomew's Hospital Museum is an instructive instance of a sarcoma of the testis complicated with hæmatocele. The patient, aged thirty-nine, received a blow from a cricket-ball on the testicle four and a half years before his death.

The testis quickly swelled, but subsequently seemed to get well. Six months later it again swelled, but without pain or impairment of the general health. Three and a half years after the injury a swelling appeared and grew rapidly. Tapping gave vent to chocolate-coloured blood, and left a solid mass behind. When four years after the injury castration was performed, the cord was not thickened and no glandular enlargement was detected. Two months later the patient's leg on the affected side began to swell. A mass could be now made out in the pelvis, and after signs of intestinal obstruction the patient died.

Specimen No. 38*b* in St. George's Hospital Museum shows a "fungus hæmatodes" of the testicle associated with a hæmatocele. The walls of the tunica vaginalis are vascular and shaggy, though there is no blood actually effused in this sac.

Diagnosis.—This is most important in old long-standing cases. It is in these more than any other scrotal swellings that mistakes have been made.

The following are the conditions in which difficulty is most likely to arise:

(*a*) **Irreducible Omental Hernia.**—Where the surgeon has seen nothing of the early stages, where the history is deficient, the question of the above may arise in an old hæmatocele which perhaps commenced insidiously, and which now presents a much thickened and irregular wall, and no definite fluctuation, owing to its thick grumous contents.

In the hæmatocele, unless it extend unusually far upwards, impulse will be entirely absent, and the cord will be more easily defined; the patient may, perhaps, have noticed the commencement of the swelling in the scrotum, and in the case of a hernia reduction will probably have been possible at an earlier date.

(*β*) **Hydrocele.**—A recent hæmatocele with supple walls and distinct fluctuation will be distinguished in most cases by the absence of translucency.* As this sign may be wanting in certain hydroceles (p. 117) attention should also be paid to the degree of fluctuation present, the weight of the swelling, and the history of the case. In later cases the degree of thickening and resistance of the coverings, and the amount of discomfort which has been experienced all along, are greater in a hæmatocele. As a rule, too, fluctuation will always be less marked in a hæmatocele. But the case recorded at p. 122 suffices to show how difficult the diagnosis may be, when an old hydrocele feels solid, is heavy, when fluctuation is indistinct, and transparency entirely wanting.

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* As advised at p. 117, before pronouncing a scrotal tumour to be opaque, the surgeon must avail himself of the aid given by a dark room, and the use of the stethoscope, &c.

(γ) **Orchitis.**—Though fluctuation is extremely obscure in a large number of hæmatoceles these are rarely so uniformly firm and solid as an old orchitis, the clot or thickened contents of a hæmatocele usually yielding to firm digital pressure. But as both may date back to an injury, as both are deficient in transparency, and as some cases of orchitis are accompanied by hydrocele and alterations in the tunica vaginalis, the diagnosis must occasionally be most obscure, till cleared up by an exploratory incision. The question of testicular sensation is not of constant value here. It is likely to be diminished in advanced chronic orchitis, but at the same time in hæmatocele, the testis itself, though more healthy, is often very difficult to find (p. 226).

(δ) **Growths.**—It is the slower forms of these which are very likely to be confused with old hæmatoceles, when the latter come under notice with much thickened walls, solid contents and deficient history. Thus, in doubtful cases, an enchondroma, one of the more fibrous sarcomata, a syphilitic "hydrosarcocele," a hæmatocele may all occur to the mind of the surgeon. It will not be forgotten that growths may often date to an injury. In many of these cases an exploratory puncture or incision is the only really reliable means of clearing up a diagnosis: the latter made carefully down to the tunica vaginalis, and carried out with antiseptic precautions is, in every doubtful case, to be preferred to a puncture, as being in every way safer, surer, and likely to give more information. Thus, by a careful incision the testis is less likely to be injured, contents which would not have flowed through a fine trocar can be readily got away, much more information can be gained, the risk of inflammation and suppuration after puncture, is removed, and a radical cure can be at once proceeded with.

The records of surgery contain numerous instances of mistakes in very able hands—hæmatoceles removed for malignant disease, and errors the reverse of this. Assistance may be gained by observing closely the rate of increase from time to time. In malignant disease this goes on steadily, but in hæmatocele it may be irregular. Sometimes the hæmatocele ceases to enlarge, or even diminishes in size; in malignant disease this is unknown. In some cases a hæmatocele after pursuing for long a slow, steady course, suddenly increases. This change is due to a sudden leakage or to inflammation. Other points which may help are the greater weight and irregularity usually met with in a new growth; thus, not only does the latter present on manipulation a bossy outline, but also a sensation that varies at different spots—viz., firmness at one place, fluctuation or a pulpy feel at another. Save in the earlier stages pain is a more marked feature in new growths, being more usually dull and aching than the so-called characteristic lancinating suffering. Testicular sensation is more completely lost in new growths than in hæmatoceles where the position of the testicle can be made out, and the cord is more likely to be implicated in the former. Finally, puncture of a malignant growth usually gives vent either to blood-stained fluid which is not large in amount or to sero-mucous fluid which is not blood-stained.* On puncture of a hæmatocele there usually escapes either grumous altered blood, or fluid blood which flows for some time, and produces a marked alteration in the size of the swelling.

Treatment.—This will vary according to the date at which the hæmatocele is seen, the acuteness of its symptoms, and the probable condition of its contents and lining wall.

(A) **Palliative.**—When the case is seen early, and when the effusion of blood is not extreme, the absorption of the latter may be expected, the complete process often occupying a long time, and being marked by the same stages as when blood is effused in other parts. The patient should be kept lying down, with the scrotum well raised on a small pillow or sandbag, and an icebag applied over a layer of lint. This is likely to be much more efficacious than a cooling lotion, which requires frequent renewal, but in elderly patients, and in cases where the tension of the effused blood already interferes with the blood-supply of the scrotum, the continued use of ice requires careful watching. A thorough purge should also be given, and its action gently kept up by small doses of magnesia sulphate, one of the saline aperient waters, &c., and the diet should be liquid and restricted, but nutritious. Where this treatment, after a week or ten days, has but little effect, or where the amount of blood effused is, from the first, very large, where the inflammation set up by the injury threatens to run high, it will be well to tap the scrotum with a medium-sized trocar,† in the hope of promoting absorption by relieving the tension. Antiseptic precautions should be taken; to avoid the entrance of air, the fluid should not be completely withdrawn. A continuance of the rest and antiphlogistic treatment should be insisted upon. When all pain, tenderness, and redness have disappeared, if the swelling is subsiding steadily, the patient may be allowed to go about, with the scrotum well strapped and supported.

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* The microscope may perhaps help here.

† The strict antiseptic precautions mentioned above (p. 232) must be followed, for fear of causing suppuration and its attendant danger of absorption.

In cases where, after one tapping, absorption takes place to a certain extent, then remains stationary, the tunica vaginalis still containing fluid blood, the puncture should be repeated. In the case of hæmatocele occurring after hydrocele, the fluid may be noticed, after repeated tapping, to be again serous.

(B) **Radical.**—*Tapping and Injection.* Whenever, after tapping, the fluid is noticed to become less blood-stained and more serous, and the tunica vaginalis is healthy and not thickened, injection of iodine or carbolic acid may be resorted to, as in hydrocele (pp. 140, 145) to complete the cure. But in all save recent cases the next mode of treatment will be found preferable as safer and surer. When the walls of the sac are altered and rigid iodine injection may be followed by dangerous suppuration and septic poisoning. In other cases the result is *nil*, save in delaying more radical steps.

Incision.—Incision and Scraping. The object here is to get rid of all clotted or solid contents, and by scraping out the inner aspect of the sac, if this be needful, to get rid of adherent blood-clot and false membranes, and to promote more rapid formation of granulation and obliteration of the cavity. The parts being duly cleansed, a free incision is made over the outer and anterior part of the swelling, the tunica vaginalis being opened with special care, as it is never easy to make certain of the site of the testicle (p. 225).* As soon as all the fluid and solid contents that will come away easily have escaped or been turned out with the finger, the surgeon should, with a sharp spoon or sponges on holders, go over the inner surface, till this is as smooth and clean as possible. If the parietal layer is readily separable, it should be detached from the remaining scrotal tunics as close up to the epididymis and cord as is safe, and then cut away with blunt-pointed scissors. Unless extremely thickened, rigid, and calcareous, the cut edge of the tunica vaginalis should be united to the cut edges of the skin with numerous fine chromic gut sutures. A little iodoform is then dusted in, or the cavity swabbed out with a solution of zinc chloride (gr. x to ℥j), the wound being then thoroughly dried out. If the cavity be a large one, with several recesses, a drainage-tube had better be employed for a few days, a counter-puncture being made if needful. Antiseptic dressings are then applied, either iodoform or sal alembroth gauze or wet boracic acid dressings, renewed at due intervals, and frequently wetted. The last dressing, if the parts have been much disturbed, is perhaps the best. The scrotum should be well supported.

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* M. Réclus (*loc supra cit.*, p. 25) advises that the finger is here a better guide than the eye, as the appearance of the false membranes may be most misleading. The finger may detect the outline and softness of the gland. He adds, that where the testicle cannot be detected, its structure is probably so altered that its position is a point of less importance.

Where a hæmatocele is suppurating it might occur to the operator to be content with a small incision anteriorly and a counter-puncture posteriorly, followed by the passage of a drainage-tube. There is always a risk that this will be tedious and insufficient. If clots are present they will take long in coming away thoroughly, and there is no opportunity of dealing with false membranes. This method should never be employed unless the walls of the cavity are supple and collapsible, or in cases where the contents are foul.

Decortication.—This method was strongly advocated by M. Gosselin. It consists in a free incision, a carefully made opening into the cavity of the tunica vaginalis, which is then more freely opened, after a finger has made certain that the testicle is not exposed to injury. The false membranes are then detached from the tunica vaginalis as far as possible in a continuous layer, either by the finger-nail, or by forceps and blunt-pointed scissors, first on one side, then on the other, as close to the testicle and cord as is safe. The separated layer is then cut away with scissors. The cut edge of the tunica vaginalis is then united, as before, to the skin, and the operation completed in the same way.

While decortication is based on the common-sense object of removing a foreign body which interferes with the obliteration of the sac and cure of the case it must not be thought that it is always a simple proceeding. It is often difficult, in practice, to separate the false membrane satisfactorily, and there is always a risk, if too much force be used, of perforating the tunica vaginalis in places, and burrowing out with the finger or instruments into the cellular tissue of the scrotum. It is not surprising, therefore, that some French surgeons have spoken of this method as difficult, and liable to grave complications—viz., obstinate hæmorrhage, cellulitis, and scrotal phlegmon.

Two, MM. Demarquay and Denonvilliers have each published two deaths from these causes. These grave results are especially to be feared when the parts have been much disturbed, when the patient's vitality is very low, or where the antiseptic treatment has been imperfectly carried out at the time of the operation, or, perhaps, owing to the restlessness of the patient, later on.

With the above facts in mind, antiseptic incision and excision of the sac, false membranes and all, wherever practicable, and careful use of the sharp spoon over those portions of the serous membrane which cannot be removed, will be found preferable.

Castration.—While the above steps, when carried out with antiseptic precautions, will be found to be free from those dangers —viz., septicæmia from the putrescent blood-clot, erysipelas, sloughing, profuse suppuration, hectic, &c.—which have in past days made incision of a hæmatocele a serious measure, there will always remain a few cases in which castration will be called for. Where it is evident that this step will make a less call on the patient's powers of repair, where patients are advanced in years or broken down in health, or the subjects of chronic bronchitis, in cases of very long standing, when the tunica vaginalis is much thickened, the seat of densely adherent false membranes, or extensively calcareous, in cases where previous operation has failed, or where the hæmatocele, only partially absorbed, has left behind a large, indurated annoying lump,* no further attempt should be made to save the testicle.

Finally when a hæmatocele has ruptured subcutaneously and the scrotal tunics are loaded with blood, and thus not in a condition to repair quickly in an elderly patient, castration is indicated.

Before performing castration in a large hæmatocele it will be well to reduce its bulk by tapping the swelling and drawing off any contents that are fluid. It is worth noting that the cord in some of these cases is enormously thickened and enlarged.

SECTION II.

ENCYSTED HÆMATOCELE OF THE TESTICLE.

This is a rare affection and usually arises in extravasation of blood into a pre-existing encysted hydrocele which has developed in contiguity to the epididymis (p. 184).

The symptoms are much the same as those of encysted hydrocele, but transparency will be wanting, and fluctuation will be much less marked or absent altogether, according to the condition of the contained blood. The history of an injury—*e.g.*, a blow or squeeze—is often present, but it is rare for the history to mention the existence of any swelling connected with the testicle before the injury. On this point Mr. Curling remarks that it is very frequent for small cysts to spring from the epididymis without the patient noticing them. Encysted hæmatoceles may, occasionally, reach a huge and thus a puzzling size, as in a case of Mr. Curling's, in which hæmorrhage took place into an encysted hydrocele which had lasted for thirteen years. The tumour then increased rapidly, becoming heavy, firm, very tender and obscurely fluctuating. It reached half way down the thigh.

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* This may be tender also (Gosselin, Monod and Terrillon).

A specimen in St. George's Hospital Museum shows that the walls of the cyst may become calcareous. This specimen is from the dissecting-room, and without history. It is described as a complete bony cyst, containing altered blood.

Another specimen in the same museum (No. 25A) shows another hæmatocele occupying, not the tunica vaginalis, but the sac of an encysted hydrocele. The patient stated that for some time he had had a swelling by the side of one of his testicles. During sexual intercourse he had a sudden attack of pain, and the swelling increased greatly. Other treatment failing, castration was performed. The testis was healthy, the swelling being formed by an encysted hydrocele distended with coagulum.

Diagnosis.—The affection for which encysted hæmatocele is most likely to be mistaken is hæmatocele of the tunica vaginalis. The point that aids most is the position of the testicle. In the encysted hæmatocele it is less sunk and buried in the swelling. It is therefore more easily made out, usually lying on the anterior part of the swelling. But as in both forms of hæmatocele the walls may be extremely thickened, the diagnosis can in some cases be only cleared up by an antiseptic incision.

Treatment.—This is, in every respect, according to the duration of the swelling and the condition of the patient, the same as that already given for hæmatocele of the tunica vaginalis.

SECTION III.

PARENCHYMATOUS OR INTRA-TESTICULAR HÆMATOCELE.

This extremely rare variety has been very little described by English surgeons. The extravasation of blood here takes place into the substance of the testicle itself. It occurs usually in combination with a vaginal hæmatocele after an injury, especially in one in which the testicle itself, in spite of its mobility, does not escape from contusion or squeezing. Probably the co-existent hæmorrhage in the walls of the scrotum, and within the cavity of the tunica vaginalis, masks the extravasation which takes place into the substance of the testis. It is possible that intra-testicular hæmatocele may account for some of those obstinate cases of traumatic orchitis, or hæmatocele, in which it is so difficult to get rid of all the swelling. We also want more evidence as to how far this condition is liable to follow a puncture of the testis in careless tapping of a hydrocele, as in the case mentioned below.

Mr. Bryant ("Lectures on Tension as met with in Surgical Practice," *Lancet*, 1888, vol. i. p. 1233) has recorded two cases. Both are of great interest, the first on account of its occurring alone, without any vaginal hæmatocele, and its successful treatment, and the second on account of its connection with the tapping of a hydrocele.

The first occurred in a man aged twenty-five, who, the day before, had received a blow upon one of his testicles, and had since suffered intense local throbbing pain, entirely unrelieved by treatment. At Mr. Bryant's visit, the patient was walking about the room, grasping his genitals and moaning with agony. There were no external signs of injury in the scrotum. The painful testicle was, however, larger than its fellow, the enlargement being in the body of the gland. Here careful manipulation detected a tense tender point. The temperature was normal, and there did not appear to be any local heat about the testicle. The introduction of a fine trocar and cannula into the above-mentioned spot was followed by a jet of blood, or blood-stained serum. With this all pain ceased, and a rapid convalescence followed.

In the second case, the patient was twenty-one. The left testicle was said to have been swollen for ten years or more, but it had only been painful since surgical treatment had been adopted. One month before the patient's visit to Mr. Bryant, a surgeon had tapped the swelling and drawn off a blood-stained fluid mixed with blood-clot. When the instrument was withdrawn the swelling steadily reappeared, and the testicle became the seat of intense pain, the pain passing up the cord. When Mr. Bryant saw him the testicle was the size of a cocoa-nut, ovoid in shape, smooth and very painful, but without heat. An exploratory incision showed the presence of a hæmatocele, but of the testicle, and not of the tunica vaginalis. There had evidently been originally a hydrocele of the tunica vaginalis, for at the time of the incision there was evidence of this fact; but the testicle had been converted into one large cyst containing broken down and fetid blood. Castration was performed and a good recovery ensued. Mr. Bryant remarks that in this case the testicle had doubtless been punctured when the hydrocele was tapped, and, as a consequence, hæmorrhage followed the puncture. The pain which followed the tapping, and which had not existed before, was clearly due to tension within the testicle brought about by the bleeding.

M. Béraud, in some observations on this form of hæmatocele (*Arch. Gén. de Méd.*, 4te Sér. t. xxv. p. 281) thinks that the arrangement of the vessels in a close network on the inner surface of the tunica albuginea may tend to favour extravasation of blood here. Two cases are recorded, which were under the care of MM. Petit and Giraldès. The symptoms appear to have been—pain, very acute at the time of the injury, and persisting long afterwards. After the vaginal hæmatocele, which is usually present at the same time, has been incised, the testicle remains swollen and somewhat hard; after a while it presents itself at the orifice of the incision into the tunica vaginalis, and the tunica albuginea giving way, a black or dark-brown protrusion is seen, which is made up of seminal tubules and clotted blood.

Diagnosis.—This must often be guesswork. Pain, very acute at the time and long persisting afterwards, the testicle remaining large and perhaps tender at one spot, are points which may lead to this condition being suspected.

Treatment.—Where there is reason to think of the existence of this hæmatocele, and where absolute rest, elevated support, and the other steps already given (p. 236) to promote the absorption of the blood have failed, the swelling should be explored by puncture or an antiseptic incision. If the testicle project after the tunica vaginalis is laid open, or if one spot feel soft and fluctuating, a small incision should be made into the gland with a tenotomy knife, and a drainage-tube inserted, after any clot has been turned out. It would be well in such a case to prepare the patient for a protrusion of the testicle, or later, an altered condition of the gland—*i.e.*, a permanent degree of hardness or diminution in size. But in cases where the testicle is much damaged by the extravasation, or the patient's condition does not justify a prolonged attempt to preserve the testis, castration should be performed.

SECTION IV.

HÆMATOCELE IN THE SUBSTANCE OF THE EPIDIDYMIS.

The following is an instance of this extremely rare condition:*

J. H., aged fifty-two, was admitted, under my care, at Guy's Hospital, November 1882. Twelve years ago he had slipped on the kerb, and received a blow on the scrotum in falling. Three or four days afterwards great pain set in, and the left side of the scrotum began to enlarge, and continued to do so slowly for two years, at this time attaining its maximum size—that of a cocoa-nut. He was then tapped, and a pint of clear fluid withdrawn. A fortnight later he was again tapped, very little fluid being withdrawn. On this occasion such peculiar and intense pain followed the tapping that the patient thought the trocar must have entered his testicle. Some iodine was injected at this time, and the patient had no further inconvenience till eight years after (two years before admission), when the same side of the scrotum began to enlarge, and continued to do so up to his admission. I first saw the patient amongst my out-patients, November 8, when he had a uniform enlargement, without bosses, of the left testicle; this was of the size of a turkey's egg, resistant to pressure, nowhere fluctuating or showing patches of softness on its surface. No evidence of hydrocele;

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* Mr. Langton has published (*St. Barthol. Hosp. Repts.*, vol. xvii. p. 188) a case of "hæmatoma of the epididymis." From the sudden spontaneous onset, the œdema of the scrotum and blackish-blue discoloration of the testis, the great mobility of this, and the deep constriction and twist at the junction of the epididymis and cord, I believe this case to be one of torsion of the latter similar to those cases occurring in younger patients, and related at p. 56.

the scrotal skin and spermatic cord were healthy. As I was doubtful whether I was dealing with an old orchitis or hæmatocele, or a slowly growing sarcoma, I advised that the swelling should be strapped, and began a course of mercury. The patient was brought back to me with the strapping well and efficiently done, and I told him that if it became painful he was to come up on the following day.* These directions he neglected. The strapping did become extremely painful, but the patient went to bed, sent for no medical man, and did not come up to the hospital until a week later (November 15). On removal of the strapping, the skin over the left side of the scrotum was found to be deep crimson-red and glossy, and to have lost its elasticity. A line of ulceration extended round this, and beyond this œdema extended as far as the root of the penis, the inner third of the groin, and backwards into the perinæum. There was no fœtor, the temperature was normal, and the patient bright and cheerful. During the next few days the crimson tint of the skin changed to black, and the line of ulceration deepened. A little later the gangrenous skin was snipped away, and healthy granulations springing up, the denuded area contracted quickly. The testicle could now be felt beneath, distinctly enlarged and hard, with testicular sensation much impaired. For these reasons, and on account of the history and the patient's age, castration was advised and performed December 4. Beyond an unusual number of bleeding points the operation presented nothing remarkable. The patient made a good recovery, and went out December 19.

The greater part of the testicle on examination was found to be pulpy and œdematous, a portion the size of a gooseberry being healthy, of the natural buff colour, and allowing its tubes to be easily drawn out. In the substance of the epididymis was a cavity, with a circumference the size of half a crown, and enormously thickened walls, fibro-cartilaginous in appearance, and enclosing pultaceous, grumous contents, consisting of altered blood. The two layers of the tunica vaginalis were closely adherent.

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* The patient's circumstances were good. He was a retired publican living at Gravesend.

SECTION V.

COMBINED ABDOMINAL AND SCROTAL HÆMATOCELE.—BILOCULAR HÆMATOCELE.*

The following interesting case of this very rare condition is reported by Surgeon-Major Gray (*Lancet*, 1883, vol. ii. p. 495):—A native, aged thirty-six, was admitted into hospital at Bombay with great enlargement of the right side of the scrotum, and also with what appeared, at first sight, to be a distended bladder. The latter belief was strengthened by the fact that there had previously been some difficulty in micturition, and by the additional circumstance that the house-surgeon, on attempting to withdraw the urine, found it impossible to pass even the smallest catheter beyond the bulb. The history, as far as it could be ascertained, was that, about a year ago, the scrotum began to swell, and gradually attained its present size. A month before admission the patient first noticed the hypogastric swelling, and it was in consequence of the rapid enlargement of this during the preceding few days, and the increasing pain and discomfort which it caused, that the patient applied for relief. He was unable to furnish any data that could throw light on the origin of the disease. All that he could tell was that up to a year before he was in perfect health, and had nothing whatever the matter with either the scrotum or cord. Urine, which had always been passed freely till lately, was now voided with difficulty, and in a narrow twisted stream. The scrotal swelling was cylindrical in shape, about six inches in diameter, and when the patient stood up it descended almost to the knee. The hypogastric swelling looked and felt, as the patient lay on his back, almost exactly like a case of retention of urine; it reached a little above the umbilicus. Both swellings contained fluid, and communicated freely with each other. A distinct wave of fluid was felt, on percussion, to pass from one to the other, and according to the position of the patient either swelling could be considerably increased in size at the expense of the other. Coughing also made the scrotum swell up. Except for this impulse no evidence of hernia could be detected. Close examination of the urethra and perinæum showed that the obstruction to the passage of urine was due to the pressure of the upper part of the scrotal tumour on the urethr A small exploring trocar proved that the swelling containe fluid blood, and a larger trocar and cannula having bee inserted, nearly five pints of this were drawn off, and bot swellings completely emptied. A large syringeful of 5 per cen carbolic-acid lotion was then injected, the trocar wound carefull closed, and an ice-bag placed over the cord. There was now n difficulty in passing a catheter into the bladder. By the third o fourth day after the tapping it was evident that the swelling were rapidly refilling. Early one morning the patient was foun in a state of semi-collapse, with both swellings larger and tense than ever. They were also tympanitic, this being due to putrefaction, as a drop of foul matter was oozing from the trocar wound Chloroform being given, the scrotal swelling was laid open fro end to end, a quantity of decomposed blood was turned out, an a large drainage tube placed in the abdominal sac, with its en hanging out through the scrotal incision. The walls of the sa were fully one-fourth of an inch thick: the opening of communication under Poupart's ligament was wide enough to admi four fingers, or a small hand. The inner surface of both sacs wa somewhat rough. The source of the hæmorrhage was sought fo in vain. The patient, after remaining in a precarious conditio for some days, rallied slowly, and about a fortnight later th redundant portion of scrotal skin and all the sac-wall belo Poupart's ligament were excised. The testicle, being atrophie to a mere nodule, was removed. The scrotal wound heale readily, while the upper cavity, which for a time discharge freely, gradually contracted, and the patient was discharged wel about two months after his admission.

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* With these cases should be compared the condition of bilocular hydrocele described above at p. 171.

Dr. J. Rochard (*L'Un. Méd.*, 1860, p. 360) relates a cas under the care of M. Huguier, of a large bilocular hydrocele in part scrotal and in part abdominal. After an injury th swelling increased rapidly in size, and owing to a large ecchymosis in the scrotal tunics the diagnosis was made of hydro-hæmatocele. This was verified by a puncture which gave ven to a brownish fluid. At a second puncture, ten days later, th fluid was limpid and transparent. A cure is stated to hav followed injection with wine.

In the above cases the bilocular swelling was partly abdominal partly scrotal. Professor Annandale has recorded (*Edin. Med Journ.*, vol. xviii. p. 714) a case of bilocular hæmatocele, i which one portion represented the right tunica vaginalis, th other, which lay to the inner side and behind the first, and was twice as large, occupied the perinæum. Tapping gave vent to brown grumous fluid. The sacs, of which the scrotal one was calcareous, were dissected out entire, the testicle being removed at the same time. The patient, aged sixty, sank three weeks afterwards from exhaustion. The probable explanation of this case is that for many years the patient had had a hæmatocele of the tunica vaginalis following on a hydrocele, and after an injury a rupture of the tunica vaginalis followed, thus leading to the formation of a second cyst after the manner of a false aneurism. The edges of the aperture of communication between the two sacs were ragged, confirming the theory of accidental rupture.

In this case, as in Dr. Gray's (p. 245), the swelling had led to retention of urine.

CHAPTER V.

INFLAMMATORY AFFECTIONS OF THE TESTICLE AND EPIDIDYMIS.

THESE may be of two distinct kinds, accordingly as the inflammation starts in the testicle or the epididymis; it being distinctly understood that the inflammatory changes which commence in the epididymis may after a while invade the gland. Indeed, acute or subacute epididymitis very quickly becomes an epididymo-orchitis. The above point being understood, the two old terms, epididymitis and orchitis, will be retained for the sake of convenience. Either orchitis or epididymitis may be acute, sub-acute, or chronic. Two common varieties of chronic inflammation of the epididymis and testis—viz., tubercular or scrofulous epididymitis and syphilitic orchitis—will be described separately.

SECTION I.

EPIDIDYMITIS.

This is met with, usually due to an urethral cause, in an acute, subacute, or chronic form. A much rarer variety, syphilitic epididymitis, occurs occasionally. Tubercular disease of the testicle usually starts in, and remains for some time limited to, the epididymis. Urethral epididymitis very soon extends to the testicle, and were it not for the convenience of retaining a familiar old name, should be known as an epididymo-orchitis.

SECTION II.

EPIDIDYMITIS, OR EPIDIDYMO-ORCHITIS, OF URETHRAL ORIGIN.

This in its acute and sub-acute forms is extremely common, especially in early adult life, from the frequency of urethral inflammation at this period. It will be seen, however, below that the above forms, originating in irritation of the prostatic urethra, are by no means unknown in elderly subjects. The chronic form resulting from the acuter ones is less commonly met with, probably from the fact that acute and subacute epididymitis cause such urgent suffering as to drive the patient to seek for cure. The chronic form, though more rarely seen, is one of much importance (p. 267).

Causes.—While there is no denying that epididymo-orchitis may be due to an injury, far more frequently it is due to some irritation of the deeper urethra, especially the prostatic portion. The following are the most frequent instances.

(i) **Gonorrhœa.**—This is the most frequent of all causes of epididymitis. It comes on in the later stages of the disease, about the fourth week, or from the third to the sixth. The reverse condition—viz., the appearance of an epididymitis at an earlier stage, *i.e.*, before the fourth week—occasionally occurs in patients whose urethra is already in a damaged condition. By the fourth week the urethritis has had time to travel back to the deeper parts of the urethra, in cases, especially, where the patient has neglected treatment, has indulged in such exercises as dancing and riding, or has returned to heavy work. More rarely the epididymitis occurs in the gleety stage. This must always be possible, whether the theory of the gonococcus be accepted as proved, or no, as we know that gleety discharges can readily be excited into purulent ones. Some authors—viz., M. Fournier (Art "Blennorrhagie," *Nouv. Dict. Méd. et de Chir., prat.* xv. p. 219) and M. Augagneur (*Soc. des Scien. Méd. de Lyon,* Dec. 30, 1885), have described cases in which the epididymitis came on at a much later date, even several years after the discharge had ceased. While this must always be possible, owing to the lighting up again of an old discharge, latent in the deeper parts of the urethra, the possibility of a fresh exposure must not be lost sight of.

Again, it is natural that frequent sexual excitement, with its erections and ejaculations, should keep up the irritation of the deeper urethra, the persistence of the discharge and so the liability to epididymitis. How far any constitutional taint (rheumatism or gout) may have influence we are ignorant; but it is quite possible that persistent passage of lithic-acid crystals may be influential.

(ii) **Passage of Catheters.**—This is familiar, as, next to gonorrhœa, the most frequent cause of epididymitis, acute or sub-acute.

It is especially probable when the use of catheters is prolonged or constant, when the size of the instrument is rapidly increased, or when aseptic precautions are neglected. While this form of epididymitis is much more likely to occur if a urethral discharge be already present, this is by no means necessary, as the repeated use of instruments leads to inflammation of the canal and a muco-purulent discharge. While most frequent in the treatment of stricture, there is no condition which calls for the use of catheters in which the patient is safe from this risk. Thus, it occurs also in catheterisation in young subjects with ruptured urethra, older ones with prostatic retention, and in cases of fractured spine.

(iii) **Lithotrity,** especially after a prolonged use of the lithotrite, the withdrawal of its blades loaded with calculous matter, or the impaction of fragments after its use. An interesting case is given below (p. 263).

(iv) **Lithotomy.**—This, if the wound become unhealthy, may, though rarely, be a cause of epididymitis.

(v) **Gout.**—This may be a cause of epididymitis or epididymo-orchitis, by causing a previous urethritis, or inflammation of the deep urethra, associated with an enlarged prostate. This form of epididymo-orchitis is not common, but is of great importance, from the age and position of the patients amongst whom it occurs, and the liability of the urethritis to be overlooked. In gouty urethritis the following points will aid the diagnosis. The scalding or smarting is complained of in the deeper urethra, rather than near the meatus, the discharge is not usually very profuse, and, being muco-purulent, is whitish rather than yellow. The patient is very liable to lithiasis, the urine is habitually very acid and loaded with uric acid or urates, dry scaly eczema is often present, and perhaps tophi and worn-down teeth. The patient has very likely been living too well, drinking rich wines, &c., or in some other way evoking into activity a latent gouty taint.

(vi) **Ulceration of the Prostate.**—Epididymitis in association with enlarged prostate usually occurs from the passage of catheters, but may come on independently of this, when an enlarged prostate, with its contained urethra, is the seat of inflammation. Some cases of suppuration and gangrenous sloughing are given below (pp. 264 and 265). Occasionally, in gouty patients a congested (not permanently enlarged) prostate and its urethra may be the site of a urethritis, in no way venereal, and thus the cause of an epididymitis or epididymo-orchitis.

(vii) **Ulceration and unhealthy condition of the urethra behind a stricture.**

(viii) **Urethral calculus impacted far back.**

(ix) **Inflammation set up about prostatic calculi.**

(x) **Contracted Meatus.**—Mr. Furneaux Jordan (*Lancet*, 1876 p. 169) has called attention to this as a case of epididymitis, by means of an urethritis. From first to last there may be no urethral discharge visible.

(xi) In rare cases **unwisely strong injections**, as in the abortive treatment of gonorrhœa, may cause so much inflammation as to bring about an epididymitis.

(xii) MM. Monod and Terrillon (*loc. supra cit.*, p. 351) have drawn attention to a case in which epididymitis was brought about, in a manner I believe unique, by irritation of the deeper urethra. An **epitheliomatous growth** had been removed from the mucous membrane of the urethra close to the prostate and the vesiculæ seminales. The removal was effected by the thermo-cautery, after the rectum had been opened by the usual free posterior incision. The mucous membrane alone was removed. Some days after, a very acute epididymitis appeared on each side successively, and subsided a few days later.

The cause of the frequency of epididymitis during inflammations of the urethra has been much discussed, and several *explanations* have been given. Thus (i), Sir B. Brodie (*Lond. Med. Gaz.*, vol. xiii. p. 218) and others have considered the epididymitis to be due to a *metastasis* or transference of the inflammation from the urethra to the epididymis. This view is founded on the well-known fact that as soon as the epididymitis appears, the urethral discharge diminishes or even disappears.

This is probably to be explained not by the substitution of one inflammation for another, but, as remarked by Kocher, by the fact that the epididymitis brings about a good deal of pyrexia, and thus the cessation of the discharge is brought about by the general condition of the patient.

(ii) Other writers have used the term *sympathy* and *sympathetic** inflammation, as apparently equivalent to the above. Both the terms *metastatic* and *sympathetic* have been made use of on account of the rapidity with which the inflammation makes its way from the urethra to the epididymis, and the apparent absence of any continuity of the inflammation from one part to the other, owing to the deep and protected position of the vas deferens in the greater part of its course. (iii) On account of this difficulty, M. Brown-Séquard has explained the epididymitis in these cases by the supposition that it is *a reflexly congestive condition* brought about by the inflammation in the urethra, in much the same way as ulceration of the duodenum has been thought to follow on a congestion reflexly set up in its mucous membrane and glands by extensive superficial burns. (iv) Lastly, there is the view, supported long ago by Mr. Rose and Sir A. Cooper, that the epididymitis is due to *direct extension of the inflammation along the vas deferens.*

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* Thus, Prof. Humphry (*System of Surgery*, second edition, vol. v), relying on what appeared to him to be the insufficiency of evidence as to the direct transmission of the inflammation along the vas deferens, wrote as follows: "I do not know that we can offer any other explanation of its occurrence than is conveyed by the term 'sympathetic.'"

This view is not only the most probable, but the one best supported by facts. Thus (α), epididymitis from gonorrhœa usually occurs late in the affection—from the third to the sixth week*—the inflammation having now had time to reach the deeper parts of the urethra.

(β) It is common to find in patients of intelligence that the epididymitis has been preceded by deep-seated pain in the groin — viz., the iliac fossa and inguinal canal — and by a thickened condition of the cord, which all point to direct and continuous travelling of the inflammation from the urethra to the epididymis.

While in some cases the cord may seem intact, this is very rarely the case when the patient has been early and carefully examined. As bearing on this point, it is noteworthy that M. Terrillon (*Bull. de la Soc. de Méd.*, 1881, No. 12, pp. 119, 155), in his experiments on dogs, by setting up epididymitis by inflammation of the deeper urethra, found that in the earliest stages the mucous membrane of the vas showed all the signs of catarrhal inflammation at a time when nothing unusual could be felt by handling the cord.

(γ) Cases have occurred in which abscesses have appeared to originate in the inflamed vas deferens. Thus, Mr. Hutchinson has recorded a most interesting case in which, after lithotrity, much vesical and prostatic irritation ensued, followed later on by a succession of abscesses, pointing in the abdominal wall in each iliac region. Of these it is said: "These began in each instance by deep-seated pain, great swelling and induration, and in each case we had to cut through a great thickness of tissue to evacuate the matter. I have no doubt that these abscesses had their starting-point in the inflamed vas deferens."

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* M. Fournier (Art. "Blennorrhagie," *Dict. de Méd. et de Chir. prat.*, p. 211) from a collection of 222 cases shows that 22 occurred in the second, 34 in the third, 30 in the fourth, 29 in the fifth, 19 in the sixth, 9 in the seventh and 21 in the eighth week. He gives 10 later cases, one as late as the seventh year. Most of these must have been due to stricture. Van Buren says that epididymitis may be looked for mainly from the third to the eighth week of gonorrhœa.

(δ) Epididymitis from stricture occurs usually when the stricture is situated in the deeper parts of the urethra. (ε) Irritation of the anterior part of the urethra by fragments of calculus or by instruments rarely causes epididymitis, whereas in the deeper parts of the urethra these are frequent causes. (ζ) In a few cases the inflammation begins and ends in the vas deferens, and never reaches the testicle at all. (γ) If the testicle be attacked, it is always secondary to the epididymis, which is reached first.

Pathological Anatomy. — The lesions produced along the lengthy and complicated seminal tract have only been carefully studied of recent years, owing to the difficulty of obtaining necropsies during the acute stage. We owe our information chiefly to the following Continental writers:—Gaussail (*Arch. Gén. de Méd.*, 1832, t. xxvii. p. 210); Malassez and Terrillon (*Arch. de Phys.*, 1880, pp. 738–768); Schepelern, *Contribution à l'Étude anatomo-pathologique de l'Epididymite blennorrhagique*, Copenhagen, 1871); Hardy (*Étude sur les Inflammations du Testicule*. Thèse. Paris, 1860).

The chief inflammatory lesions are given below. Owing to the wide area along which symptoms appear, other parts remote from the epididymis must be referred to. The lesions are those of a muco-purulent catarrh of varying intensity.

1. **Urethra.**—The prostatic urethra is injected and vascular, occasionally the seat of whitish granulations (Hardy). The orifice of the ejaculatory ducts stands out markedly, of a bright red colour.

2. **Vas Deferens.**—Its walls are thickened, red, and vascular, and the muscular tissue infiltrated with inflammatory deposits, the increase in size of this canal being thus accounted for. The mucous membrane loses its epithelium, which becomes granular, and quickly shed. On squeezing a cut section of the vas a purulent fluid exudes, containing pus cells and altered epithelium, but after the first few days no spermatozoa (Terrillon). This writer has also drawn attention to the fact that this purulent

coats of the vas deferens, which become thickened and indurated, and all the epididymis is affected.

In the *third* degree the inflammation extends beyond the vas deferens to the cellular tissue uniting the constituents of the cord, and is limited only by the fibrous sheath which surrounds these constituents.

In the *fourth* degree the inflammation may extend further still, reach the connective tissue outside the common sheath, and spread to other cellular tissue, as to that of the scrotal skin.

When the acute stage is over the lesions disappear usually in an order the reverse of their appearance.

The inflammation of the skin and cellular tissue of the scrotum, constituting the inflammatory œdema so characteristic of acute and sub-acute epididymitis, disappears quickly and completely. The walls of the vas deferens remain, for a longer period, enlarged, but, in the great majority of cases, return to their normal condition. The body and head of the epididymis, in which the lesions are usually but little marked, become natural equally quickly. But in a certain number the lesions persist in the tail of the epididymis, and perhaps, also, in the mucous membrane of the vas deferens. The tail of the epididymis, especially, remains enlarged, forming a veritable nodule, which persists for a long time and may never disappear. To this condition, and its very important results, I shall return when I speak of chronic epididymitis (p. 276).

Symptoms of Acute and Sub-acute Epididymitis.*—One of the earliest is uneasiness, aching, or a sense of weight in the epididymis, often attributed by the patient to some fancied or imaginary shock or blow. But intelligent patients will often tell of deep-seated discomfort which has existed in the regions of the iliac fossa and groin† for some days before the epididymis began to swell.

Examination, not often feasible at this early stage, shows, if it be carefully conducted, some enlargement, or, at least, some tenderness to pressure, of the vas deferens and the tail of the epididymis. Rigors or chilliness and pyrexia are also usually present in acute cases. Uneasiness soon gives rise to severe and increasing pain. This soon becomes sickening, and the patient complains that it makes him feel faint. The cause of the severity of this pain has been disputed. It is probably due to acute inflammation producing œdema and tension in the epididymis, and in the connective tissue which ties its coils together and surrounds them, also to acute congestion of the tunica vaginalis and the consequent effusion into an unstretched sac. Some writers have thought from the character of the pain, sickening and causing faintness, and thus analogous to that produced by compression of the testicle, that it is due to inflammation of the testicle itself. It will be seen from the account of the pathological anatomy of epididymitis (p. 255) that the inflammation is mainly limited to the epididymis, the testicle usually escaping save for some degree of congestion and œdema. It is possible that with an organ so tightly girt in as the testicle, even this slight degree of inflammation is sufficient to account for the severity of the pain. As soon as the inflammation of epididymitis is established the urethral discharge rapidly diminishes, though there is nearly always sufficient left when the urethra is emptied by squeezing, to secure proof of the cause of the epididymitis. As soon as the epididymitis subsides, the discharge usually reappears.

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* These refer especially to the most frequent form of epididymitis, that due to gonorrhœa.

† In those rare cases where the inflammation only lightly attacks the vas deferens and then subsides, the symptoms go no farther.

Other evidence of epididymitis will be seen in the increasing size and tenderness of the tail of the epididymis. The whole of this soon appears enlarged, due to extension to the body and head (usually slight in degree), but much more to the involvement of the connective tissue between the epididymis and the tunica vaginalis, and implication of the latter and some effusion into its cavity. As has been said at p. 98, acute hydrocele is much more common in epididymitis than in acute orchitis, as the areolar tissue of the epididymis is in direct contact with the tunica vaginalis by connective tissue, whereas, in the case of orchitis, the testis and tunica vaginalis are separated from each other by the barrier-like tunica albuginea. In some cases the epididymis can be made out as an irregular, crescentic mass at the back and outer side of the testis, and separated from it by a more or less distinct furrow or depression. But in many cases, and in all the acuter ones, what with the exquisite tenderness of the parts, and the way in which the lower part of the vas, epididymis, tunica vaginalis and testis are embedded and surrounded by inflamed tissues, it is impossible to separate one part from another in the mass which they form.

The existence of fluid in the tunica vaginalis can usually be detected by dipping with the finger over the front of the swelling.

It has been above stated that the cord is in many cases swollen and painful as high up as the external ring. Beyond this point tenderness may be detected along its course. If this swelling be extreme, owing to the unyielding nature of the fibrous structures of the canal, the local pain and the vomiting, coupled as they usually are with constipation, may simulate hernia. I have above (p. 253) alluded to the fact, that the inflammation may only extend some distance along the vas deferens and then subside.

Dr. F. N. Otis (*Pract. Clin. Lessons on Syphilis and the Genito-urinary Diseases*, vol. ii. p. 392) has met with instances of this. He mentions cases in which passage of a bougie was followed by pain in the perineum, extending up along the back and along the loin. After a day or two's rest this trouble passed off. In another case, again after the pass of a bougie, pain occurred, pursuing the same course, but continuing down the groin, and causing a little aching in the corresponding testicle. The cause of this pain not being recognised, the bougie was again passed, and this time an acute attack of epididymitis followed. M. Gosselin ("Déférentite blennorrhagique," *Gaz. des Hôp.*, 1868, No. 66) had before drawn attention to these cases where the inflammation, instead of reaching and localising itself in the tail of the epididymis, is arrested at some point of the canal. An elongated, rather rounded, mass may be found in the course of the canal, stopping short some distance from the epididymis, and occasionally not descending beyond the orifice of the external abdominal ring.

The tissues of the scrotum are very commonly red and œdematous, and this causes features which are very characteristic and especially well seen in those patients who have continued to get about in spite of the epididymitis. To use a term given and explained by Mr. Hutchinson (*loc. supra cit.*), "the swelling is almost always flat-sided, a condition due in part to the great disproportionate swelling of the epididymis pushing the gland in front of it, and, in part, to moulding of the œdematous scrotum against the thigh."

In those cases, happily rare, where the inflammation is very high and where sloughing of the epididymis or testis follows, as in the ones I have mentioned at p. 265, the symptoms may be most acute. Before the intense pain and acute tenderness are replaced by the boggy softening and relief to pain which betoken what has happened, the nausea and anorexia which are always present may have been accompanied by vomiting and hiccough.

The pain and intensity of the inflammation in acute epididymitis usually increase for from four to six days, and then having reached their height remain stationary for two or three more, and then decreasing, have usually disappeared by the tenth or fourteenth. The swelling of the epididymis remains, but in a painless state, for some time longer. It is of course liable to be retarded by exercise, too early passage of instruments, excesses, &c. The common sequelæ of epididymitis are given later (p. 267).

Before leaving the symptoms of epididymitis, two described by French writers may be attended to. They are perhaps connected together. According to M. Jullien (*Malad. Vener.*, p. 112) seminal emissions are liable to occur very frequently about fifteen or twenty days after an attack of epididymitis. MM. Monod and Terrillon describe these emissions as liable to be blood-stained, a point only of importance from its effect on the mind of the patient. The source of the blood has been a good deal discussed. It is probably from the vesiculæ seminales. In some of the few necropsies which have been made in acute epididymitis the corresponding vesicula seminalis has been found inflamed, enlarged and thickened, and its surrounding cellular tissue injected and adherent to the adjacent parts of the peritoneum.* MM. Monod and Terrillon say that during the early stage of epididymitis a rectal examination has nearly always enabled them to prove the existence of acute sensitiveness in the position of the affected vesicle.

Varieties of Epididymitis.

1. **Bilateral Epididymitis.**—This is exceptionally rare, and I believe it never happens that while one side is the seat of *acute* mischief that the other is attacked in the same way. What is seen sometimes, especially in careless patients and in those exposed to the causes of relapse, is that as epididymitis is subsiding the other side is attacked. The orifices of the ejaculatory ducts are so minute and so closely adjacent that any swelling set up about one must necessarily spread to and close the other.

But when mischief persists in the deeper urethra and the inflammation of one vas deferens and ejaculatory duct has slowly subsided, and these parts do not return quickly to a healthy state, inflammation may readily enter the other vas deferens. In this way an alternating epididymo-orchitis, the "see-saw orchitis" of M. Ricord, may be set up. The relative frequency of bilateral orchitis may be gathered from the statistics of M. Fournier, who, out of 879 cases found the left side attacked in 408, the right in 405 cases; 68 being bilateral.

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* Velpeau ("Inflammation des vésicules séminales," *Gaz. des Hôp.*, 1856) drew attention to this fact. See also Section IV. DISEASES OF THE VESICULÆ SEMINALES.

2. **Inflammation of the Cord.**—This condition, called by French writers funiculitis, has been already alluded to (p. 253). In addition to the rare cases already given, Kohn (*Wien. Med. Press*, 1870, Heft 7) relates a case in which, while the vas was inflamed, the epididymis and the testicle escaped. MM. Monod and Terrillon refer to cases of M. Gosselin's in which the inflammation reached, and was localised in, the vas aberrans of Haller (*Clin. Chir.*, t. ii.; *Gaz. des Hôp.*, 1871 and 1873); Zeiss also met with a similar case (*Allge. Wien. Med. Ztg.*, 1870, Heft. 48, 49, 50, 51).

3. **Epididymo-Orchitis in Retention or Ectopia.**—This very rare condition has been alluded to at p. 61.

4. **Epididymo-Orchitis of an Inverted Testicle.**—The only point of importance here is the need of precaution when tapping has to be resorted to for the relief of an acute hydrocele.

5. **Neuralgic Epididymo-Orchitis.**—This variety is rare, and is met with chiefly in neurotic patients, M. Gosselin (*Leç. Clin.*) has insisted upon its importance. The pain is now felt not only in the affected parts but in the loins, and sometimes, reflexly, in more distant parts. In some cases the neuralgic pains are marked early in the inflammation, in others later on; while in a third class the neuralgia is chiefly marked by its persistence, which lasts long after the inflammation has subsided and the cure is apparently complete. In this feature this neuralgia recalls the condition which sometimes, especially in the aged, persists after the apparent cure of herpes zoster.

Complications of Epididymo-Orchitis.—These, though rare, are of much importance owing to the gravity of some of them.

1. **Suppuration in the Cavity of the Tunica Vaginalis.**—This is rare in the common form of epididymo-orchitis coming on after gonorrhœa, in young and healthy subjects. MM. Monod and Terrillon's remark (*loc. supra cit.*, p. 339) that it is more common in those cases which are started by surgical interference with the urethra or bladder, is supported by the only case which has come under my own observation. The patient was a pallid, flabby man of forty-three, from whom I had removed, by the supra-pubic method,

a stone weighing 6 ozs. As the wound was slow in healing, soft catheters were passed to facilitate washing out of the bladder. Urethritis followed quickly, and extending down the left vas deferens, set up deep-seated abscess in the iliac fossa, epididymitis, and suppuration of an acute hydrocele. The man ultimately did well, though very slowly, after opening of the abscess and drainage of the suppurating tunica vaginalis.

This complication is of much importance, as if the closely adjacent tunica albuginea be softened by inflammation, hernia of the testicle may follow. M. Vignerot (*Bull. de la Soc. Anat.*, 1889, t. iii. p. 486) records a case in which this condition of suppuration of the tunica vaginalis co-existed with, and was caused by, that which is next described—viz., abscess in the testis. The predisposing cause was, apparently, stricture. Castration was performed, and the patient, aged seventy-three, recovered.

2. **Abscess along the Vas Deferens or in the Testicle.**—Cases illustrating the first of these have been already given. Suppuration in the testicle has been confused with suppuration of an acute hydrocele. The two conditions may co-exist. The testicle is more likely to suffer in broken-down, weakly subjects, and much more so in epididymo-orchitis due to operations on the urethra than in that following gonorrhœa.* The rareness of suppuration in epididymo-orchitis, frequent and acute as this often is, may be explained in part by the remarkable development of the lymphatics of the testis, and their origin in wide lacunar passages between the seminal tubules ; the results of inflammation, unless such have accumulated in large quantity, being thus easily absorbed. When the urethral origin seems at all doubtful or insufficient, the possible existence of a syphilitic taint or the presence of tubercle is always to be borne in mind. When inflammation of the testicle terminates in suppuration, and the pus is not absorbed, it may occasionally make its exit by a fistulous opening, after which a cure takes place, though the testis remains harder and smaller than its fellow. Or, owing to the resistance of the tunica

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* Drs. Wilks and Moxon (*Pathological Anatomy*, second edition, p. 533) speak of having, on four occasions, met with suppuration of the epididymis in pyæmia ; in these cases there was a considerable quantity of pus, running on into the condition of abscess. The condition was then very difficult to distinguish from tubercular inflammation, but the pus was more liquid, and the tissue around more brightly injected ; chronic thickening, too, was absent ; the disease also did not extend far along the vas deferens.

Mr. Sheild, quoting from an article by Garden (*Med. Times and Gaz.* 1871), shows that in India abscess after lithotomy is not unknown. Out of 799 cases orchitis occurred 16 times, and in 5 of these suppuration requiring incision followed. Dr. Garden met with this complication chiefly in the aged, and more frequently on the left side, a fact which he attributes to the position of the incision.

The following case (Dr. Weekes, *Brit. Med. Journ.*, 1887, vol. i. p. 933) is of interest on account of the apparent absence of septic causes (a point always to be thought of with regard to catheters) and also from the fact that no discharge was visible. The patient aged sixty was enfeebled by alcohol and social misfortunes. For many years he had suffered from at least two urethral strictures, the result of old gonorrhœas. Once or twice a year he was in the habit of having these dilated. With some difficulty a No. 8 catheter was passed through the anterior, and a No. 4 through the posterior stricture. No bleeding and very slight pain followed. Two days later Dr. Weekes found the patient suffering from acute epididymitis. After ten days treatment the local symptoms did not abate, the scrotum being red and œdematous, and the left testicle much swollen and painful, with obscure fluctuation at its upper and back part. An incision here let out about ℥ij of fetid pus. This, under the microscope, showed no spermatozoa, but abundance of putrefactive organisms. A week later, the patient was well. The catheters were new ones, and between the time they were passed and the onset of orchitis there had been no urethral discharge.

Van Buren (*Diseases of the Genito-Urinary Organs*, p. 412) gives the following cases: A gentleman aged seventy-five, with an enormous prostate, who had been obliged to employ the catheter constantly, for many years, to empty his bladder, failing in health during the winter of 1868, was suddenly seized with swelling of the right testicle, which became exceedingly painful, but not very large. The swelling remained stationary for a number of days, when the patient had a sharp chill. After a few days more the organ began to grow larger, the scrotum adhered in front, fluctuation became apparent, and an incision gave exit to a large quantity of matter from the substance of the testicle. In 1872 the testis was considerably atrophied, and a fistula remained. In 1873 the patient died of apoplexy.

A gentleman of very gouty habits, who had as well an enlarged prostate, was attacked by subacute cystitis of the neck of the bladder, when also run down in health. He was obliged to continue the use of the catheter. Both testicles swelled, one after the other, and, after much pain and suffering, abscesses formed in the substance of each. The epididymis and tunica vaginalis were also, in this case, affected simultaneously with the secreting structure of the testis. In another case briefly given by Van Buren, also due to the habitual use of catheters for enlargement of the prostate, both epididymes were affected, and simultaneously.

3. **Sloughing or Gangrene of the Epididymis or Testicle.**—As with the complications already mentioned this one is more liable to occur in broken-down subjects and after instrumental interference with the urethra. The only case which has come under my own observation was that of a billiard-marker aged twenty-three, plethoric, and addicted to drinking and other excesses, who was admitted under my care in Guy's Hospital with acute epididymo-orchitis of the right side. He stated that having a gleet and some contraction of the urethra, he had had the latter rapidly dilated up in two sittings with steel sounds, at a special hospital. Acute epididymo-orchitis followed. When admitted the right half of the scrotum was brawny. The next day a softer patch was present, and an incision into this opened a sloughy cavity about the size of a walnut in the testicle itself. The tunica albuginea was soft and dullish grey, instead of bluish-white. About ʒij of pus and sloughs escaped, followed by the protrusion of seminal tubules. The man recovered with the loss of the greater part of his testicle. In other cases of gangrenous orchitis very little or no pus is present. Mr. Hutchinson (*loc. supra cit.*) gives the case of an old gentleman of eighty, in whom gangrenous, sloughy orchitis followed on long-standing prostatic irritation and the passage of calculi. A case of orchitis ending in gangrene will be found in the *New York Medical Journ.*, June 1880. Here the hydrocele which accompanied the primary orchitis appears to have been converted into a hæmatocele by repeated tappings, and the gangrene to have set in from this time. The scrotum was enormously distended, and its right half tympanitic. The testis was removed and the patient recovered.

The following case of gangrenous epididymo-orchitis I owe to my old friend Dr. Norburn. It is of great interest from the bilateral inflammation following the use of coudée catheters, and the persistent mischief on one side ultimately becoming gangrenous. J. P., aged seventy-five, a publican, but hale and hearty, and vigorous in mind and body, had used black coudée catheters for ten years for enlargement of the prostate. Dr. Norburn was called to him January 27, 1892, and found him suffering from bilateral acute epididymitis which had begun the preceding day. The scrotum was kept suspended and lead and opium lotion and salines employed, and in three or four days the right side had nearly resumed its normal condition. The left however did not subside. Dr. Norburn was not asked to see the patient between February 2 and February 17, and found that linseed poultices had been used throughout, and on one occasion leeches, the left side of the scrotum remaining the size of a fist. Glycerine and belladonna were now employed. The patient was decidedly weaker, and had two or three attacks of diarrhœa during the next few days. The urine was normal.* The swelling was red and very œdematous: on gently making deep pressure it was found to be tense, but not uniformly so, some places being softer than others. At the upper part and below were two very tender spots. At one time fluctuation was suspected, but the extreme œdema rendered decision on this point doubtful, and successive examinations often gave varying results. March 1, a purple spot appeared at the upper part of the swelling, the next day the skin broke, and a little purulent stuff exuded. Sloughing extended to the size of a five-shilling piece, when a healthy line of demarcation appeared all round. Where it was possible to separate the dead from the living tissues with a probe the gangrene appeared to extend to some depth. The swelling was now almost painless. The patient was put on tonics and nutritious diet, iodoform and vaseline being applied locally, and, when last seen, he was doing very well. Dr. Norburn was told that a large slough came away leaving a gaping wound which had healed entirely by the end of April. Not long after the patient became delirious and died. M. Gosselin (*Clin. Chir.*, t. ii. p. 401) describes cases of indolent gangrenous orchitis, in which the mischief came on with but little pain, and perforated the albuginea without any suppuration.

4. **Peritonitis.**—Several instances of this terrible complication have been recorded. It may be started by inflammation of the vas deferens in the iliac fossa, or of a vesicula seminalis in the true pelvis. The peritonitis may remain localised to the pelvis,

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* M. Verneuil (*Gaz. des Hôp.* 1884, t. lvii. p. 155) records a case in which orchite nécrosique supervened after the use of catheters in a man of forty-five, apparently robust, the subject of stricture. The urine was albuminous, and to this M. Verneuil attributed the unusual course of the orchitis.

and ultimately be cured, or, becoming general, may end fatally. This is especially likely to occur when a retained testis becomes the seat of epididymo-orchitis. This is shown by Curling's case, mentioned at p. 62. The following is recorded by the late Mr. Berkeley Hill (*Syphilis and Local Contagious Disorders*, p. 552). A young man was admitted into University College Hospital with obstinate constipation, stercoraceous vomiting, fever, and great tenderness of the abdomen, especially of the left flank and inguinal region. The right testis was present in the scrotum, but the left could not be discovered here or in the inguinal canal. The man had been suffering from urethritis for several weeks. After death, which occurred in three days, extensive peritonitis was found to have originated round a small inflamed testis which lay close to the internal ring. Mr. Hill had also seen a case in which suppuration of a testis situated in the inguinal canal occurred as a sequence of gonorrhœa. Here an incision let out a considerable quantity of pus, and the man recovered.

5. **Pseudo-Strangulation.**—I have alluded to the onset of symptoms simulating intestinal obstruction in very acute epididymo-orchitis at p. 258. Just as such symptoms may follow strangulation of a retained testicle (p. 54) when inflamed owing to the pressure of the parts around, so it may occur sometimes in epididymo-orchitis with a testicle in its normal place. MM. Monod and Terrillon would attribute this mainly to distension of the tunica vaginalis by an acute hydrocele, as when this sac is punctured, the fluid escapes with a jet, and the symptoms are relieved.

Modes of termination of epididymo-orchitis.

1. **Much the commonest is resolution, and return of the gland to a healthy state.**

2. **Interference with the outward passage of the seminal fluid.** This result is not a common one. It is of obvious importance in cases of bilateral epididymitis (p. 259), or in patients who expose themselves subsequently to the repeated infection of gonorrhœa, on account of the risk of sterility. In most cases the epididymis returns to its natural state. Any lingering induration usually remains longest in the globus minor or tail where the inflammation was first noticed. In a very few cases a little hard lump persists at this spot. M. Gosselin published (*Arch. Gén. de Méd.*, t. xiv. p. 405. and t. xv. p. 40) several cases in which during dissection the lower end of the epididymis was found to be obliterated in a mass of dense fibro-cellular tissue, apparently result-

ing from old previous inflammation. No fluid could be injected from the vas deferens through the obstruction, the tubules in the body and head of the epididymis were often dilated, but contained spermatozoa, these bodies being usually wanting in the vas deferens and vesicula seminalis, though these organs were of natural size. While obliteration was most frequently met with at the tail of the epididymis, M. Gosselin also described obliteration as occurring in its head, but as instead of a single canal the seminal ducts are here multiple, the obstruction is not so important. One very interesting case of obliteration of the vas throughout the greater part of its course is also mentioned. It is noteworthy that in spite of the block in the epididymis and the consequent retention of semen in these cases, the testicle undergoes little change. This, and the absence of atrophy, may be explained by the abundant facilities for absorption which are provided in this organ. M. Gosselin thought that as long as the obstruction in the epididymis persisted, the seminal fluid was devoid of spermatozoa, but that in the disappearance of the block they would reappear. According to Godard, Liegeois and Terrillon, the last observation is not always correct, as in some cases, long after all signs of the obstruction have disappeared, spermatozoa may be absent from the fluid ejaculated. This is perhaps explained by the long persistence of pus in the semen found microscopically by M. Terrillon (*Bull. et Mém. Soc. de Chir.*, 1881) due to a purulent catarrh kept up in some part of the seminal passages. This subject, with its treatment, is referred to again in the chapter on STERILITY.

3. **Atrophy.**—This is very rare after gonorrhœal or urethral epididymo-orchitis of any kind. M. Gosselin in all his long experience had only met with one case after gonorrhœa; this being explained by the rarity with which the testis itself is severely inflamed. When atrophy of the testis after inflammation is mentioned, it is usually orchitis after injury, cold, or ungratified sexual desire which is meant, and not an epididymo-orchitis of urethral origin.

4. **Neuralgia.**—This term includes somewhat different conditions—viz., those where the testicle remains after an attack of epididymo-orchitis, tender and sensitive, these being made worse by movement or excitement. In other cases there is no tenderness, and the pain is not constant. In some cases it is possible to make out or to suspect some local cause for the pain, such as an obstructing nodule in the epididymis, recent adhesions in the tunica vaginalis, or some inflammatory thickening about the vas

deferens, into which some nerve-twig may have been drawn. These cases are always most troublesome, on account of their obstinacy, the way in which they are exaggerated by the neurotic, and the trouble which such patients give. See NEURALGIA OF THE TESTICLE, p. 452.

Treatment of Acute and Sub-acute Epididymo-Orchitis.—This will, of course, vary with the cause of the inflammation and its degree. In an acute case the patient should be kept absolutely in bed, in less severe cases, on the sofa. The scrotum should be thoroughly supported and raised with a well-fitting suspender.* Where ice has to be used it may be applied over the bag of the suspender advised below. Other means, but less efficient, of keeping the part raised, are a small square sandbag, or a large handkerchief folded into a triangle; the middle of the base of this placed below the scrotum, while the two ends and the apex are brought up and fastened to a bandage running round the body above the iliac crests. To keep the handkerchief in place and yet to allow of its being drawn firmly upwards a tape should be stitched into the base of the triangle, and then carried over the perinæum and fastened to the waist-bandage behind. Another way of supporting the scrotum when the patient is recumbent, is by stretching across the thighs a piece of Leslie's strapping, two feet long and four inches wide, which is attached to either buttock. This forms a supporting shelf to the testis. The ice should be applied in a small sponge-bag or bladder, in small pieces and frequently renewed. Diday advises that one bag be placed below and another above the inflamed part; in any case two should be at hand, that there be no delay when they are changed. If the weight of the ice cannot be borne (and this is usually to be met by using small pieces, which also come better in contact with the inflamed part), or, if in a weakly or elderly patient, the severity of the cold of ice is to be deprecated, a layer of lint applied frequently out of iced lead lotion is a good substitute. But, as a rule, the use of ice as above directed is the best local application† for the first forty-eight hours of acute orchitis, it removes pain and lowers the temperature more quickly than any other treatment, and by the contraction of the dartos and cremaster which it brings about, it gives well-sustained support and natural rest to the inflamed testis. But to be of service it must be applied early, after the first forty-eight hours it is of much more doubtful efficacy. As long as the scrotum gets paler, smaller, and less painful the benefit is undoubted, but where after decreasing somewhat the swelling no longer subsides, but remains bulky and somewhat tender, where redness and pain persist and any acute hydrocele does not disappear, it is no good persisting with this remedy. If the practitioner is anxious about gangrene he has only to suspend the employment of the remedy, and to note how soon heat, pain and tenderness return. Occasionally hot applications are found more grateful to the patient, perhaps from their tendency to cause relaxation of the unyielding fibrous structures which surround the testicle itself. In such cases lead and opium lotion, decoction of poppy-heads, or hot boracic acid lotion, applied by means of lint or spongio-piline are good remedies, but to be of service they require frequent changing, and are thus inferior to the ice-bag.

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* Of all these I much prefer that invented by Mr. Keetley. The open web of which the scrotal bag is made and readily renewed, the india-rubber anal ring, and the very efficient abdominal band and buckle combine to ensure thorough elevation as well as suspension, moderate compression, and cleanliness.

† The ext. of belladonna and glycerine, too often used, is futile in these cases of acute epididymo-orchitis.

Where it is evident that an acute hydrocele is present great relief will be given by tapping or puncturing this. Velpeau strongly urged this practice, and it is one which should be earlier and oftener made use of. A spot being chosen where it is evident that fluid is present, and the possibility of an inverted testicle being decided, a very sharp tenotomy knife or small scalpel scrupulously cleansed by dipping it into boiling water is quickly but carefully introduced into the sac, allowance being made for the thickened state of the scrotal tunics. As the blade is withdrawn the puncture is slightly enlarged, and a small jet of the hydrocele fluid follows, and then a few drops of blood. The puncture should be closed with a little collodion and iodoform, and it is well before cutting to see that the spot chosen is cleansed.

A case quoted by MM. Monod and Terrillon from Montanier (*Gaz. des Hôp.*, March 1858) goes a good way towards proving that acute hydrocele is largely responsible for much of the pain met with in acute epididymo-orchitis. After the tapping of an acute hydrocele with a lancet, hæmorrhage followed, arterial, very difficult to arrest, and perhaps from the testicle itself, which was inverted. Pressure, made use of to stop the hæmorrhage, caused the blood to collect in the tunica vaginalis, and as the distension increased the patient again felt pains analogous to those of which he had complained before the tunica vaginalis was punctured.

Another method of treatment, the value of which was much discussed in this country some years ago, is puncture of the testicle itself. This, introduced originally by Vidal (de Cassis) (*Traité de Chir.*; *Journ. de Med. et de Chir. Prat.* Oct. 1884; Velpeau, *Anat. Chir.* t. iii; Salleron, *Arch. Gén. de Med.*, 1870, t. v. p. 163), was never generally adopted by English surgeons, and has now dropped out of use in France as well. By the above-named surgeon and by Mr. Smith of King's College (*Lancet*, 1876, vol. i. p. 43 *et passim*) it was claimed that this method gave more speedy relief than any other, while it was equally safe and harmless. One or two fallacies should be here pointed out with regard to what has been described as puncture of the testis. It is clear that when M. Vidal (de Cassis) spoke of having operated in this way on more than 400, and Mr. H. Smith on more than 1000 cases, these surgeons were referring not to real acute orchitis as we see it after injury, but in a very large proportion of their cases to venereal or urethral epididymo-orchitis. Now it is notorious that in these cases severe inflammation of the parenchyma of the testis itself is not usually seen, it is inflammation of the epididymis, the adjacent cellular tissue and of the tunica vaginalis with which we have to deal. Again, in many of these cases of supposed puncture of the testis followed by immediate relief, it is the tunica vaginalis which has been opened and tension of an acute hydrocele which has been relieved, the testicle never having been reached at all. Further experience has shown that this method is by no means so safe and sure as Mr. H. Smith with his extraordinary experience held to be the case. Hernia has followed with escape of the seminal tubes,* and also suppuration of the tunica vaginalis (Beaunis, *Gaz. Méd. de Strasbourg*, 1870). That it is by no means certain to give relief is shown by the late Mr. McGill, who stated (*Lancet*, 1876, vol. i. p. 112) that while watching Mr. Smith's practice, he "noticed that while many cases received benefit, others received little or none." In twenty cases in Mr. Spencer Watson's practice (*ibidem*) there had been the like uncertainty. Puncture of the testis may very occasionally be not only justifiable, but absolutely required in those cases where, after acute orchitis, the presence of pus in the substance of the testis is suspected. Under such circumstances, as in the cases given at p. 241, the blade of a tenotomy knife, scrupulously clean, may be passed into the substance of the testis, usually at its anterior border or inner surface, for about three-quarters of an inch, one or more punctures being made if needful, but not too close to each other.

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* M. Salleron (*Arch. Gén. de Méd.*, 1870) mentions two cases in which minute punctures of the testicle for epididymo-orchitis were followed by loss of the whole of its structure.

Where the inflammation runs very high in a plethoric patient and the surgeon wishes to make use of blood-letting, opening one or two of the scrotal veins is to be preferred to the use of leeches. Before the venesection the patient should stand up, and the parts should be fomented with hot water. But even these precautions often fail in producing sufficient distension of the veins, the condition of the superficial blood-supply giving no adequate indication of that within the tunica albuginea. Leeches, whether applied to the scrotum or along the cord, are liable to cause a noisome mess,* the hæmorrhage being sometimes very difficult of arrest, and giving rise to troublesome itching. Far worse troubles have been caused by them in the shape of erysipelas, suppuration and sloughing.

In nearly every case after the use of ice, or when the patient is compelled to get about, marked relief will be given, and the duration of the case shortened by the application of silver-nitrate (ʒj–℥j) with a camel's hair brush all over the surface of the swelling. When one application has dried another should be painted on, until pricking or smarting is complained of, powerful counter-irritation not actual vesication being required. A good deal of smarting and stinging is set up by this application lasting from half an hour to three hours, but the relief is a little later decided, and the result excellent. The vivid redness becomes paler, the stretched, glossy skin shrivels, the swelling shrinks and soon admits of handling, and the patient is able to get about again with some degree of comfort. We owe this method to Mr. Furneaux Jordan (*Brit. Med. Journ.*, 1861, vol. i. p. 161). I have repeatedly found it of the greatest service, and in no instance more strikingly so, than in the case of a member of one of our largest firms of firework exhibitors, who after going about actively in business with a gonorrhœal discharge, came to me one morning with a most acute epididymo-orchitis, begging for immediate relief as it was imperatively necessary that he should leave town that night to superintend an exhibition of fireworks at Milford Haven, where the Channel fleet was lying. After applying the silver nitrate I saw no more of the patient for about six years, when he again came under my care, this time for perinæal section for a stricture which resisted the employment of catheters. I then heard that he had been able to make his journey in comparative comfort, occupy himself the next day in the necessary preparations, and carry out the needful superintendence of the following night's display.

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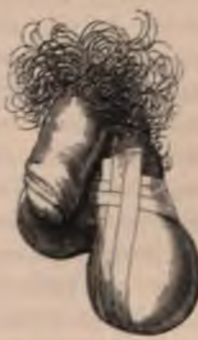
* This is especially likely to follow, if the leeches are applied at night, and the patient, a little later, gets warm in bed.

A day or two after the employment of the silver nitrate strapping may be applied: in some cases, especially if ice has been diligently applied from the first, it may be possible to make use of strapping after the first forty-eight hours. Very few words are needed as to a method which should be familiar to all. But the following points are not sufficiently attended to. The parts should be thoroughly shaved. The testis should be well isolated from its fellow by a collar of strapping applied over one of lint at the root of the scrotum. Far too much time is wasted in plastering the parts with the short pieces of strapping which are elaborately shown in every drawing (Fig. 41). What is really wanted to do the work efficiently and quickly is a long piece of Leslie's strapping about the width of the finger well wound on from below upwards, its end being lightly fixed above, in a circular fashion, and, of course, not too tightly at first. Plenty of moulding and careful pressure with the hollows of the hands is required to make the strapping fit snugly, and a suspensory bandage or a bag of lint should always be worn afterwards.

FIG. 41.



A testicle partially strapped. (Curling.)

The use of collodion in acute epididymitis or orchitis was strongly recommended by M. Bonnafont (*Arch. Gén. de Méd.*, 1854, t. i. p. 733), who stated that after its application the swelling, redness, and excessive pain yield in about half an hour, the cure being complete in two or three days. The collodion seems to act beneficially in three different ways—by the withdrawal of heat owing to the rapid volatilisation of the ether, by compression, and by the exclusion of the air. For acute cases the above remedy has seemed to me to be very inferior to ice in its power to give relief from pain, while in less acute cases its compression, though undoubted, is weak and tardy.

To sum up, rest, with the use of ice, and, where this is impossible, the application of silver nitrate in a strong solution; strapping as early as possible; a collection of fluid in the tunica vaginalis being always opened at once where acute suffering is present:—these are the most important points in the local treatment.

Where pus is thought to be present in the testicle, a puncture should be made, as already advised (pp. 241, 271). This is especially needed where a retained testis, the site of suppuration, is fixed in by fibrous surroundings. In those very rare cases mentioned at pp. 62, 267, where a testis retained in the abdomen is the cause of suppuration and peritonitis, it should be removed by abdominal section, the incision being made over the iliac fossa, and the peritonæal cavity cleansed. And the same course must be pursued where suppurative peritonitis follows on inflammation of the vas deferens (p. 254).

I turn now to more general details. The bowels should always be well acted on several times. In young and strong patients 10 gr. of calomel (with the *dura ilia* of hospital patients 5 or 10 gr. of pil. gambog.) may be given, and its action maintained daily by some milder aperients. Except for aperients, injections of morphia if needed, and very low diet with plenty of bland liquid, I attach very little importance to anything save the details of local treatment, to the importance of which I have already drawn attention. But if the medical man attaches more importance to drugs in these cases—and I am speaking of epididymo-orchitis of urethral origin as we usually see it in young and healthy patients—he has his choice amongst the following. Where the patient is strong and plethoric, salines with antimony may be prescribed in some such form as this:—Vin. antim. tartarat. ♏xl–lx, tr. hyosc. ♏xl, mag. sulph. gr. xv–xx, aq. camph. ℥j, every three or four hours at first, the antimonial wine being diminished as soon as the pain is relieved, and the frequency of the pulse is reduced. Salicylate of soda in 15 or 20 gr. doses has been strongly advised by Dr. Henderson (*Lancet*, 1882, vol. i. p. 1027). I have been disappointed with this in outpatient practice and in urgent cases where the patient must get about. For those who can rest I should attach much more importance to other means.

Anemone pulsatilla has been strongly praised in inflammatory affections of the testicle, epididymis, and cord. Papers on this subject will be found by Lydston (*Chicago Medical*, 1882, p. 261) and Chambers (*Chicago Week. Med. Rev.*, Jan. 1885), and in France by Martel (*Bull. de Thérap.*, 1885, p. 129, 1886, p. 207). In this country it has been recommended by Dr. Brunton. Dr. Smith, in a very brief note (*Brit. Med. Journ.*, 1887, vol. i. p. 111), claims that it subdues the intense suffering in the above affection so rapidly that it is unnecessary to employ morphine, whilst the swelling and heat subside more rapidly than under any other drug. No cases however are given. Dr. Bowie (*Lancet*, 1885, vol. ii. p. 947) gives a case in which two drops of the extract of pulsatilla every four hours had the most markedly beneficial action in a case of inflammation of Cowper's glands, and speaks of a similar happy result in acute inflammation of the testes and prostate.

In many cases other details will be remembered. Thus, sandal-wood oil in capsules, or copaiba, or injections into the urethra, may be useful when any discharge again makes its return. Tonics also, and feeding up, will be needed in some cases.

A few words will now be said of cases of orchitis or epididymo-orchitis of other than urethral origin.

In the orchitis which follows mumps no lowering treatment is to be adopted. I have elsewhere (p. 279) spoken of the need of taking the temperature regularly, and of insisting on rest from the first when this complication is threatening. Ice is rarely required in these cases, but lotio plumbi and rectified spirit in equal parts, or hot boracic-acid lotion applied on lint, and a little frequently dropped on without disturbing the parts, will give relief. Or the application of extract of belladonna and glycerine worked up into a creamy consistence, thickly smeared over the part, and also applied on lint, may here be sufficient. Some gentle laxative (*e.g.*, pulv. glycyrrh. co. ʒj) should be given as required; also liq. ammon. acet., with bark, or liq. hyd. per. with an acid, or, if pills are preferred, a few grains of pulv. Dov. and hyd. c. cret., every four or six hours. If the pain is very severe, morphia should be given subcutaneously. The patient should keep the testis supported for some time after the attack, and owing to the possibility of after-coming atrophy (p. 280), he should be warned to be careful, and to remain for a time under observation.

The above directions will also serve for those rarer cases of inflammation of the testis and its immediate surroundings which are sometimes met with after some of the fevers—*e.g.*, typhoid. In the variety complicating ague, or met with in patients who have suffered from this in the past, quinine should of course be given. In all these cases tonics and supporting diet will usually be required.

In the form of orchitis dependent upon gout, the latter is usually of the incomplete form, and acute paroxysms are absent. To relieve the pain ice may be employed, or if, from the age of the patient, this is not thought safe, one of the lotions mentioned above may be substituted. Colchicum will be of little service in these cases. If the tongue is foul, the primæ viæ loaded, and the liver congested, some blue pill, or the following: Pil. hydrarg. gr. jss, pil. rhei co. gr. jss, ext. col. co. gr. jss, ol. junip. ♏j, may be given at night, followed in the morning by one of the mineral aperient waters. Every four or six hours some citrate of potash and sulphate of magnesia should be given, a small tumbler of boiled, or any of the effervescing waters, being taken directly afterwards.

In rheumatic orchitis the local application of one of the above lotions, or laudanum and hot water on soft flannel or lint, regularly applied, will give most relief. The testis may be strapped in a few days. Internally, if the skin is inactive, something like the following: Pot. citr. gr. x, pot. iodidi, gr. v. mist. guaiaci, ℥j, four times a day, may be tried, followed by a small tumbler of water. Where, as is often the case, this form of orchitis occurs in debilitated subjects, quinine, bark, or cod-liver oil will be found useful.

I have hitherto spoken of the acute and subacute forms of epididymo-orchitis. Attention must now be paid to that variety of **chronic mischief** which, as pointed out at p. 267, sometimes lingers in the tail of the epididymis, blocking this and interfering with the passage onwards of the semen. If this mischief be bilateral and persist, sterility will result, and in after years the blame of childlessness may be most unfairly laid to the charge of the uterus, or other equally innocent organs, the ovaries. How far a gouty, tubercular, or strumous taint may increase the tendency to this chronic epididymitis we do not know for certain. But it is clear that, in the future, especially in cases where there have been previous attacks of epididymitis, the surgeon must not be content to let his patients leave off treatment as soon as relief from tenderness and pain admits of their getting about. He must examine the epididymis carefully, and when there is any evidence of thickening, even if one-sided, must point out its importance, in view of possible future attacks, and insist on further and prolonged **treatment.** In addition to the use of mercury, iodide of potassium, and perhaps sodium salicylate and ammonium chloride internally, oleate of mercury, or iodine, or potassium iodide ointment, must be perseveringly employed, aided by the use of flying blisters if needed. Where the patient is weakly the cure must be aided by sea air and tonics, the perchlorides of mercury and iron being combined. If the patient persist in treating this relic of his attack as an unimportant matter he should be warned that if it become bilateral and permanent, though there be all the signs of virility with desire and power of copulation and emission, there is likely* to be no impregnation in consequence of the absence of spermatozoa in the fluid emitted.† If a patient who is sterile apply for further treatment—*i.e.*, of a more surgical and radical kind—this should on no account be performed. It is likely to be useless, if not disastrous, for if the wound does not run a distinctly aseptic course, the later condition of the patient may be rendered worse than the first. Billroth (*Clin. Surg.*, p. 293) records a case in which he acceded ultimately to the wish of his patient, though he expressed a doubt whether the operation would have any beneficial effect. Having laid open the scrotum on both sides he drew out the testes, carefully removed the nodules, replaced the organs, and then sutured his wounds. These healed up by first intention, but notwithstanding repeated attempts he was unable to learn whether the operation had the desired functional effect.

Where the chronic epididymitis is prolonged, or recurrences of inflammation are induced, the presence of a stricture or other source of chronic swelling or gleet must be suspected. When these are removed, the epididymo-orchitis, unless of too long standing, subsides under appropriate treatment. In obstinate or recurrent epididymitis it is therefore always well to examine the condition of the urethra by passing a bougie. Such remedies as sandal-wood oil, and injections of gradually increased strength, need only be alluded to here. Such cases should not be neglected, because, as after gonorrhœa, the tubes of the part are liable to be damaged or destroyed by effusion of lymph and other effects of protracted inflammation.

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* Mr. Curling (*loc. supra cit.*, p. 261) quotes a case under Mr. Godard's care in which sterility of the above described kind was cured after having lasted eighteen months.

† M. Liégois (*Med. Times and Gaz.*, Sept. 25, 1869, p. 381) examined twenty-eight cases of bilateral epididymitis at various periods after the attack, and found spermatozoa in only seven; of these the affection was in five from accidental causes—*i.e.*, not from gonorrhœa. M. Liégois accordingly makes a distinction in this respect between the *external* epididymitis and the blenorrhagic or *internal* (that is, commencing in the interior of the tube), believing that the latter is much more likely to interfere with the passage of the semen.

Acute and sub-acute epididymitis and epididymo-orchitis occur, though rarely, **in infants and children.** Usually no cause is given, but I believe if these cases are carefully examined, a contracted meatus or a phimosis will often be found to have caused an inflammation of the delicate mucous membrane of the urethra in these patients, and so to explain the case. In other cases, the constant restless movements of the lower limbs so habitual at an early age may have inflicted a slight injury upon the testis, in spite of its small size and mobility, and so have set up a degree of traumatic orchitis, a moist condition, akin to intertrigo of the scrotum and thigh, perhaps contributing to the lesion by interfering with the smooth and easy movements of the organ. In other cases the presence of tubercle must be remembered as a possible cause. Mr. Curling (*loc. supra cit.*, p. 271) gives two cases of "acute orchitis" in an infant of five months, and one in a boy of two. But, as in each of these cases, as the swelling subsided, the cord remained thickened and indurated, I should be inclined to look on them as cases of epididymo-orchitis, of possible urethral origin, such as I have mentioned above. In the elder of the two children the tunica vaginalis suppurated and discharged. The opening healed a month later, but some slight induration remained "at the back part of the gland."

Inflammation of the Testicle and its Immediate Surroundings due to General Diseases often Infectious.—Next to injury, or engorgement of the testicle as causes of orchitis, comes a group in which the inflammation of the testicle occurs as part of a general disorder which is in many cases an infectious one. None are of common occurrence. Most are extremely rare, in this country at least. The occurrence of one or two is disputed. The disorders which form this group are:—Mumps, typhoid fever, small-pox, scarlet fever, influenza, malaria, and perhaps tonsillitis. Instances of orchitis from general diseases not infectious are seen in gout and rheumatism.

Orchitis due to Mumps.—This is usually a true orchitis; much less frequently an epididymitis is present from the first. It begins usually about the time that the glandular swelling is disappearing, about the sixth to the eighth day, and is often preceded by a rise of temperature. It is by far most frequently met with in young adults or in boys who have reached the time of puberty. It is almost unknown in childhood or old age. Dr. Dukes, of Rugby, has published some interesting observations on this point in boys (*Lancet*, 1881, vol. ii. p. 744). Of twelve cases, in six the orchitis began on the seventh day, in four on the eighth, in one on the ninth day, and in one on the first. This last case was anomalous; the parotids were not affected from first to last, but only the sub-maxillary glands, and the symptoms were extremely severe. The above authority points out that age* is a very valuable guide in treatment. Thus, all such cases should be kept in bed till the ninth day, the temperature taken regularly, and on the slightest rise (for this is often premonitory) hot applications applied to the scrotum. Even if orchitis is not prevented by these steps its pain will be much mitigated, and the acuteness of the general symptoms diminished.

The **course** of this orchitis is rapid, the testis becoming enlarged to twice its size, tender and painful. Pain varies much from a slight feeling of tension to real acuteness radiating into the canal, loins and hypogastrium. The vas deferens and epididymis usually escape; if the latter be involved, it is to a slight degree. If any redness of the scrotum or effusion into the tunica vaginalis be present, these are but slightly marked. The testis preserves its smooth rounded outline and is less hard than in other forms of orchitis. The affection reaches its height in about four days, and then soon subsides. Thus, moderate swelling, speedy development and quick decline are amongst the chief features of this orchitis. While it lasts the orchitis is most annoying, the dull, aching pain telling very much on a patient who is already pulled down by the pain, dysphagia, &c., which usually accompany an attack of parotitis. As one testicle subsides the other may be inflamed, but it is rare for both to be attacked simultaneously. When the two are attacked successively the second orchitis may be late; thus, M. Maubrac (*Gaz. Méd. de Paris*, 1890, p. 31) has observed it on the sixteenth day of the illness.

It has been stated above that the onset of the orchitis may often be predicted by a return of the fever, generally without rigors. It is also noteworthy that for some hours before the appearance of the orchitis the symptoms may be grave and most misleading. Thus, (α) there may be much collapse—*e.g.*, anxiety, pallor, small pulse, and coldness of the extremities; or (β), the symptoms may take the form of intense fever, delirium, epistaxis, and diarrhœa. As the orchitis appears the other symptoms improve.

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* Thus it is very rare before twelve or fourteen. Fabrè has seen one case in a child of nine. The above fact is explained by the slight development and little functional activity of the gland before puberty.

Resolution and absorption of any effusion is the commonest result of this orchitis, and is the rule in boys, but atrophy, sometimes markedly rapid and complete, has been met with in many cases, especially in those which have occurred in some epidemics. This atrophy may come on rapidly, and may follow apparently mild cases of parotitis. In this country it is very rare. In three cases which I have seen in medical students, it was a softness and flabbiness of the testicle which had been attacked, that caused the apprehension of coming atrophy. No such change however followed. It has been especially met with in French regiments in barracks. Thus, M. Dogny records (*Journ. de Méd. et Chir.*, 1832, t. iii. p. 10) an epidemic in which, out of a garrison of 800 men, eighty-seven were attacked with orchitis; of these eighty-seven one testis was affected in twenty-three and both in four, but in all the twenty-seven cases atrophy of the affected testicles took place. M. Laurens (*Rev. de Mém. de Méd. Milit.*, December 6, 1876) records a similar epidemic in a regiment. Of the 118 attacked with mumps, thirty-two patients had orchitis, twenty-six on one side (the left testicle being affected in seventeen, and the right in nine), and six on both sides. In sixteen out of the thirty-two more or less wasting* and softening of the testicle followed. In another case, recorded by M. Lereboullet, a young man aged twenty-two, of robust health and possessing all the characters of virility, was attacked with mumps. The disease seemed mild, but on the fourth day though the parotitis had not disappeared, double orchitis came on. Atrophy soon followed and advanced rapidly, and at the same time that this was noticed the sexual power and masculine voice began to disappear, and the mammary glands, which were previously quite normal, were noticed to develop steadily.

While the above cases and many others that might be quoted prove that atrophy is a real sequence of orchitis, I believe that this occurrence is very rarely met with in this country or in America. Considering the comparative frequency of orchitis, it is not credible that well-marked cases of atrophy, if this were not extremely uncommon, should not have been recorded by now. It must be remembered that this form of orchitis occurs in young adults in all ranks of life, and that any consequent atrophy, if at all common, must have had attention drawn to it from the mental anxiety which it would have caused. It is interesting to note that Sir A. Cooper met with no instance of this kind in his practice, and of the two which came under Mr. Curling's notice, neither was under his care during the orchitis. In one case, nine years, and in the other two years, had elapsed between the orchitis and the patient's visit to Mr. Curling.

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* It is very difficult to estimate correctly the reality of this wasting. M. Laurens allows that, six months after the epidemic, there were no progressive changes in sixteen cases which he then examined.

Treatment.—As this possibility of atrophy exists and as the orchitis of mumps is attended by much and depressing aching the patient should be kept in the recumbent position till the ninth day of the attack of mumps, in the hope of preventing any orchitis. If a rise of temperature (and the importance of taking this regularly has been already mentioned, p. 279) points to orchitis, the patient should be warned, and the testicles elevated and gently compressed by an efficient suspensory bandage. If the patient is not seen so early and orchitis is present, lead and opium lotion, or boracic-acid lotion, applied in each case as hot as possible, mild laxatives, and injections of morphia or small doses of Dover's powders, will be the chief measures indicated.

Nature of the Orchitis in Mumps.—The connection between the orchitis and the parotitis has usually been described as metastatic—*i.e.*, the inflammation leaves one organ to attack another, the transference occurring usually to the testis, much more rarely to other parts—*e.g.*, the ovaries, or the meninges of the brain. Against this view, which has too much been taken for certain, the following points may be urged. As pointed out by M. Rilliet, it is not a true metastasis, the parotitis, though lessening, is still present usually when the orchitis appears, and no case has been recorded in which the orchitis suddenly disappeared and the parotitis reappeared. Again, why, when it is the salivary glands that are inflamed, should the inflammation be especially transferred to glands so widely remote in position and so different in structure as the testis? As the disease is one of puberty and early adolescence, if the breasts were first affected, the transference to the testis, considering the tenderness and enlargement of the breast and testis often present at puberty, would be intelligible; but no such sequence is constant, the breasts often escaping altogether. As I pointed out in 1882 (*Syst. of Surg.*, vol. iii. p. 517), it is much more probable that the inflammations of the salivary glands, the testis, &c., are different localised manifestations of one pyrexial condition, probably due to a special organism. The following seems to support this view:—While the specific organism to which mumps is due cannot be said to have been definitely discovered, it is only a question of time before bacteriologists put the origin of the disease on the same firm foundation as they have done with so many other diseases. Thus, MM. Cafitan and Chavin found in the blood of patients with mumps organisms which they were able to cultivate. Absolute confirmation is, however, wanting, as the experimental inoculation of cultures failed.

The different localised manifestations, of which the orchitis is one, may occur quite independently of each other. In some cases it is the orchitis which comes first, occurring epidemically, and followed after a while (*e.g.*, after a period of one to five days, Crevissier d'Hurbache, Lynch, Berard, Rizet) by parotitis, the order usually described being thus reversed. Orchitis may even constitute the whole malady, the "orchite ourlienne sans parotidite" of French writers.[*] On other occasions the two affections have occurred simultaneously.[†] Again, during epidemics of mumps, individuals who have shown no trace of swelling of the salivary glands have been attacked by orchitis.[‡] Thus Ressynier gives a case in which a young man became the subject of orchitis without any parotid affection. This occurred at Montpellier in an epidemic in which orchitis was very prevalent. One most interesting case is recorded by Bluff (*Gräfe u. Walthier's Journ.*, Bd. xxi.), in which a man whose wife was suffering from parotitis was attacked with double orchitis. Another case in which the testis was attacked without any parotitis being present is recorded (*Lancet*, 1885, vol. ii. p. 189) by a medical man who does not give his name. It is not only interesting from the patient having orchitis alone, but also on account of his age. A man aged fifty-two, married and free from any urethral discharge, was sudsuddenly seized with swelling of the right testis and epididymis. Two of his sons were found ill at the same time with well-marked parotitis. The patient had never had any swelling of the face, and had been quite well up to the same day as that on which one of his sons had been taken ill. When he was seen three days later, there was no swelling of the parotid.

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[*] Kovacs gives two such cases (*Wien. Klin. Woch.*, 1890, Bd. xxi.).

[†] Ressynier (*Med.-Chir. Rev.*, vol. vii. p. 204); Kocher, *Krank. d. Hoden*, Bd. iii. S. 239.

[‡] Boyer Montpellier, *Journ. de Méd.*, Mai 1867, p. 239; Kocher, *loc. supra cit.* S. 238.

Finally, it is well known that other complications—*e.g.*, meningitis, wrongly termed metastatic—are not uncommon in mumps. In some of these cases meningitis and orchitis co-exist.* In others the orchitis sets in as the meningitis is subsiding.

All the above appear to me to point strongly to the fact that mumps is an infective specific disease, which may show itself by divers manifestations localised in different parts of the body. Why the testis is so often attacked is not far to seek, when the age of most of the patients, and the co-existent activity of the sexual organs is remembered.

Kocher (*loc. supra cit.*, 240), rejecting the theory of metastasis as being unintelligible, since "according to the old interpretation the inflammation leaves one organ to go to another, like an unclean spirit," explains the connection between orchitis and parotitis as follows: Orchitis after mumps is, according to him, an urethral orchitis, in which the inflammation extends from the urethral mucous membrane to the testis along the vas deferens. Kocher thus traces the inflammation. Beginning as a stomatitis, the inflammation soon reaches the salivary glands. It then travels along the pharynx to the intestinal tract, and thence, after a few days, by means of blood-infection a slight cystitis is set up, from which springs secondarily the inflammation of the testis. Kocher likens the above affection of mucous membranes to erysipelas. In this he comes very near to what I believe the correct view of the origin of this orchitis, but I cannot at all agree with his statement that the affection of the testis is a urethral orchitis—*i.e.*, correctly speaking, an epididymo-orchitis. It is the substance of the testis itself, and not the epididymis, which is usually, and in all cases primarily, affected. Furthermore, we have no evidence of the existence of any cystitis.

Orchitis after Typhoid Fever.—This form of orchitis has been especially studied by Continental writers. Its occurrence was first pointed out by Velpeau (*Dict. de Méd. ou Répr. Génér. des Sci. Méd.*, art. Testicule, 1844). One sees, says he, at the end of certain severe fevers—*e.g.*, typhoid and variola—certain articular inflammations, certain affections of the bones, purulent infections, and acute orchitis supervening, without an appreciable external cause. Incomplete clinical facts were given in 1864 by M. Chedevergne, and in 1867 by M. Bouchut. In 1873 M. Hanot (*Bull. de la Soc. Anat. de Paris*, 1873, p. 589) gave a complete account of typhoid orchitis. Dr. Cervelle ("Considerations sur une variete d'orchite aigue compliquant certaines fièvres graves," Paris 1874) published two cases. In 1877 and 1878 MM. Widal and Sabourin brought before the Clinical Society of Paris (*Bull. de la Soc. de Paris*, 1877 and 1878), the former three cases, and the latter one. M. Hanot published three more cases (*Arch. Gén. de Méd.*, 1878, t. ii. p. 595). Three more French papers have appeared more recently by M. Eloy (*Un. Méd.*, 1883, p. 818), and MM. Larquier and Sadrain (De l'orchite dans la fièvre typhoide, Paris, 1882 and 1883).

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* *Lancet*, 1883, vol. ii. p. 280; 1890, vol. ii. p. 1156. In these patients, a boy aged fifteen and a man aged thirty-five, the symptoms—*e.g.*, headache, excitement and delirium—were extremely severe. *Brit. Med. Journ.*, 1881, vol. i. p. 966.

Very few English writers have alluded to this subject. In 1872 Dr. Duffey published (*Dublin Journ. Med. Sci.*, vol. liii. p. 97) a paper on orchitis secondary to Malta or Mediterranean fever. He held that a large number of these were nothing but typhoid fever.

M. Ollivier (*Rev. de Méd.*, 1883, t. iii. p. 829) gives a *résumé* of the literature of typhoid orchitis, and 27 cases which he has collected. In 14 of these it is stated that orchitis and epididymitis were both present; in 10 there was orchitis alone; in 3 cases the inflammation was limited to the epididymis.* In 15 cases the right side, in 11 the left, was attacked. In one the side is not given. *Date of Occurrence.*—In 21 out of 27 patients this complication came on during convalescence.

Age.—It is most frequent in young subjects, thus, 14 were between fourteen and thirty, 3 between thirty and thirty-five, 2 above forty, in 7 the age is not given, in one the patient was a child four years old, and besides the orchitis and typhoid had parotitis. The gravity of the typhoid fever does not seem to exercise any influence upon the orchitis; the patients are often weakly and much pulled down.

Symptoms.—These, at the onset, vary according as the orchitis comes on during the course or during the convalescence of the typhoid. In the first case the pain at first attracts but little attention, in the second the complication is ushered in by more or less acute pain and return of fever. The pain sets in suddenly or gradually in about an equal proportion of cases. All the signs of parenchymatous orchitis appear either alone or accompanied by epididymitis or, exceptionally, by vaginalitis.

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* But in one of these (obs. xi.) it is stated that the testicle was a little enlarged. In a case of Fraenkel's (*Deutsch. Med. Woch.*, 1888), the epididymitis, which appeared during convalescence, seems to have been secondary to a prostatic abscess.

Termination.—The most usual one is slow, steady, and complete recovery.* In several cases induration in the head or tail of the epididymis persisted for some time. Only one case of atrophy seems to have been reported, but in six cases collected by M Ollivier, abscess, usually starting in the testicle itself, in one case in the epididymis, occurred. The abscess may be acute or chronic, and testicular substance is found in the discharge, and ultimately the organ is lost. This form of orchitis seems to be distinguished from others by its liability to suppuration. This last point is not supported by the experience of others—*e.g.*, that of M. Eloy given below. M. Jaccoud (*Ann. des Malad. des Organ. Gén. Urin.*, 1891, p. 262) mentions a case in which 'typhoid orchitis suppurated.' During convalescence pyrexia again returned and orchitis was found to be present. The swelling progressed for a fortnight and was accompanied by increasing pain and much redness of the integuments. The epididymis remained intact. At the end of a month a pustule discharged, giving vent to pus and testicular debris. Suppuration lasted for a month. It was thought that this suppuration was due to the typhoid bacillus, contrary to what ordinarily happens, it was impossible to find any pyogenic microbes.

M. Eloy (*L'Un. Méd.*, Nov. 18, 1882) quotes numerous observations of orchitis during typhoid fever. The onset is often sudden, with a rise of temperature during the fever or the convalescence. The pain is not usually so great as in urethral epididymo-orchitis. One testicle only is affected. The epididymis, he thinks, always escapes. In seven out of nine the right side is attacked. This complication is usually benign, terminating in about ten days by resolution. The attack may be fugitive. Suppuration, persistent induration of the testicle, or atrophy, follows very rarely.

M. Levestre (*L'Un. Méd.*, 1882) believes that typhoid orchitis is more frequent in convalescence, and that the inflammation is often trifling, points which may help to explain the fact that this complication of typhoid fever has been little mentioned by English writers. His patient after a severe attack of typhoid fever, while walking about the ward in full convalescence* and free from fever, suddenly felt a severe pain in the right groin and found this side of his scrotum reddened and the testis swollen and painful. The epididymis was not involved, but the cord was slightly painful. There was no urethral discharge. The inflammation gradually subsided, and disappeared at the end of six days. According to M. Levestre the attack is usually sudden, and comes on during convalescence, three, six, ten or twenty days after the cessation of the fever. It is usually accompanied by a return of the pyrexia, the temperature rising to 103° or 104°, and being even accompanied by rigors. He points out that, if the local pain is slight, a relapse of the typhoid may be suspected, and that in any case of unexplained pyrexia during typhoid convalescence the testicle should always be examined. The onset of the orchitis before the typhoid fever is over very rarely takes place. The pain may merely amount to uneasiness. The inflammation is unilateral and the epididymis is never involved. The right side is most frequently attacked. In the majority of cases the inflammation is trifling, not going beyond the stage of congestion, and clearing up in six to ten days. Sometimes it is only transitory, of the nature of hyperæmia. Much more rarely suppuration, induration, or atrophy follow. M. Levestre believes that this complication is met with in certain epidemics only.

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* One patient only of M. Ollivier's twenty-seven cases died. This was the child aged four, the death taking place some days after the appearance of the orchitis. The cause is not given.

Nature of the Orchitis in Typhoid Fever.—As this Protean disease may show its effects in many tissues, it is not surprising that the testicle does not escape.† I suggested in 1882 (*Syst.*

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* The above information has been taken from French writers who have studied this matter very carefully. That similar cases are not altogether unknown on this side the channel is shown by the following:—Two cases will be found recorded by Dr. Hamilton and Dr. Manby (*Lancet*, 1882, vol. ii. pp. 1039, 1064) in which orchitis after typhoid fever was observed. In both it came on suddenly in convalescent patients. Mr. Harrison (*Lancet*, 1883, vol. i. p. 997) mentions a case in which partial sloughing of the testicle followed on this form of orchitis. Mr. Sheild (*Med.-Chir. Trans.*, vol. lxxiv. p. 80) gives an account of two cases in both of which a sloughing abscess formed in the testicle. In one of these the testicle, removed by Mr. Bloxam, is in the Museum of Charing Cross Hospital. In this case the scrotum had continued to enlarge slowly, since the third week of the fever, and the characters of the abscess were by no means defined. On incision the tunica vaginalis was full of pus, which proceeded from the abscess in the testicle. Two other cases are mentioned, in one of which suppuration urgently threatened.

† This view is supported by the case of M. Jaccoud's quoted above, in which it was ascertained that the suppurating orchitis was due to the typhoid bacillus. Chauternesse and Widal have found the microbes of Eberth in the testicles of patients with typhoid. Jaccoud, Tavel, Ménétrier believe that suppuration is due to the presence of these micro-organisms.

of Surg., vol. iii. p. 518) that in some cases an exciting cause of the orchitis might be found in a slight injury inflicted upon the testicle during the delirium of the patient. But this view would not explain those cases which arise during convalescence. A more likely explanation, especially for these later cases, is to be found in phlebitis of the spermatic veins, a view which is supported by the thrombosis and subsequent varicose condition met with in the veins of the lower extremities in patients after typhoid fever.

Other explanations which have been put forward are:—Bacillary emboli (Larquier). The inflammation of a cystitis or urethritis (set up by the fever) travels down by the vas deferens, and so reaches the epididymis and testis. The view held by Dr. Duffey and others, that the orchitis of typhoid fever is only met with in patients of rheumatic antecedents.

Orchitis due to Small-pox.—This form, spoken of by Velpeau and Gosselin, has been carefully studied by Béraud. The last-named writer (*Dict. de Méd.*, t. xxxix. p. 468; *Bull. de la Soc. Anat.*, t. xxii. p. 107; *Arch. Gén. de Méd.*, 1859, t. i. p. 274; "Recherches sur l'Orchite et l'Ovarite Varioleuses") believes from an examination of the contents of the scrotum in eight cases after death from small-pox that he has established the existence of two distinct lesions, viz. (*a*) peripheral, which may be divided into acute inflammation of the tunica vaginalis, and the formation of inflammatory deposits in the tail of the epididymis; and (*β*) parenchymatous or actual orchitis. While the peripheral conditions are not infrequent, it appears that real orchitis during small-pox is rare, only one case being given. Quinquaud (*Arch. Gén. de Méd.*, t. xvi. p. 329) examined three cases in patients suffering from small-pox.* In one there was a parenchymatous orchitis with marked effusion into the tunica vaginalis. In the other two an autopsy showed the existence of an inflammatory mass of induration in the tail of the epididymis. Dr. Chiari, of Prague (*Wien. Med. Presse*, 1889, Heft 27, S. 1126), has also described a variolous orchitis. He recognised naked-eye lesions which, microscopically, were found, he believed, to resemble very closely the cutaneous pustules. In sixty-two cases which he examined (thirteen during the time of eruption, twenty-eight during that of suppuration, fourteen during desiccation, and seven after the variola was cured), he found the testicle attacked in forty-five. An orchitis with inflamed and sloughing patches, was the chief feature. In seven cases micrococci were found in the morbid patches or around them. The micrococci were not pyogenic, and suppuration never occurs. The necrosed patches are absorbed, and all trace of the lesions disappears.

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* In these cases it is distinctly stated that there had been no gonorrhœa for several years.

Symptoms and Course.—The onset is usually sudden, and duration of the disease short, lasting only a few days. The symptoms are those of pain, swelling, &c., and probably due in different cases to inflammation of the testis, epididymis, or tunica vaginalis. In patients, the subjects of this disease, often unconscious and delirious, this complication may easily be overlooked. As a rule only one side is attacked, and according to Béraud complications or serious after-effects are very rare. Occasionally some thickening may be felt about the tail of the epididymis, and MM. Monod and Terrillon mention one case of Ricord's in which a suppurating effusion in the tunica vaginalis occurred during small-pox.

Treatment.—This will be the same as that given for acute hydrocele, orchitis, and epididymitis.

Inflammation of the Testicle or its Immediate Surroundings in Scarlet Fever.—This must be extremely rare. The two following cases are given by MM. Monod and Terrillon (*loc. supra cit.*, p. 372). One was communicated by Dr. Henoch to the Society of Medicine of Berlin (*Berl. Med. Gesellsch.*, Feb. 14, 1815; *Berl. Klin. Woch.*, 1865, Heft 12). In a boy aged eight, on the nineteenth day of a severe attack of scarlet fever, a rapid effusion took place into each tunica vaginalis, a large, true acute hydrocele thus causing a scrotal swelling larger than the fist. The child died, but no mention is made of the condition of the tunica vaginalis. The second case was reported by Dr. Heurteloup (*Dict. Encycl. des Sci. Méd.*, 3^e série, t. xvi. p. 578). In a child of six, on the second day of "a very confluent scarlatina," there was a scrotal swelling as large as a pigeon's egg. Here again there was an effusion into the tunica vaginalis. On depressing the fluid with the finger it was easy to make out that the epididymis was hard and swollen, and three times as large as its fellow. The swelling of the epididymis disappeared on the commencement of the desquamation, but the acute hydrocele was not completely absorbed until the fifteenth day.

Mr. Sheild (*loc. supra cit.*, p. 82) quotes the following case which was communicated to him by Dr. Sweeting of the Local

Government Board. "The patient was a boy of six, admitted June 2, 1886, into the Fulham Fever Hospital. The lad was desquamating, with cervical adenitis, nephritis, and dropsy. Subsequently, a fluctuating swelling was detected in the scrotum, and opened July 19. Much pus escaped, apparently from deep down; the testicle was enlarged and inflamed."

Orchitis complicating Influenza.—The following are the only cases which I can find recorded. Dr. E. Zampetti (*Gazetta degli Ospitali*, No. 73, 1890) met with three cases of orchitis in 1500 cases of influenza which he treated. In one the body of the right testicle suppurated; the abscess, when opened, gave vent to a large quantity of pus and black blood. A cure readily followed. In the second and third cases there was right-sided orchitis which subsided quickly. In the third case the left testicle was attacked a little later, and also quickly got well.

Dr. Harris, of Cranbrook, published (*Lancet*, Jan. 2, 1892) an interesting note of a case of acute orchitis following influenza in a patient aged sixty-seven. After the pyrexia and distress of the influenza had disappeared, the patient was attacked with pain, redness and swelling of the left testicle. From this he gradually recovered. Having been in bed the patient could have had no injury, and he had no trouble with his urine. Dr. Kelly, of Desford, near Leicester, published an exactly similar case in a patient aged thirty-two (*Lancet*, Feb. 13, 1892).

Inflammation of the Testicle and its Immediate Surroundings in Malaria or Ague.—This has been described by several surgeons in charge of soldiers who have been exposed to the above diseases in some of the French colonies. The best account of this complication is by Dr. Charvot (*Bull. et Mém. de la Soc. de Chir.*, 1887, t. xiii. p. 597). As the result of six cases under his own observation Dr. Charvot agrees with MM. Girard (*Siècle Méd.*, 1888), Maurel (*Traité des Malad. paludéenes de la Guyane*, 1883), and others, that there exists a particular form of inflammation of the genital glands as the result of malarial poisoning.

Symptoms and Course.—It is hardly seen except in old subjects of malaria,* at a late period of the disease. Intermittent or remittent fever precedes or accompanies the orchitis, and if cut short by quinine, tends to return later when the local lesions are resolving.

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* M. Molinas (*Arch. de Méd. et de Pharm. Milit.*, May 1889) records a somewhat exceptional case. A young soldier, in Tunis, who had never had intermittent fever, was seized with epididymo-orchitis without apparent cause. This pre-

The orchitis begins most often, suddenly, and at night. Sometimes it has a slower origin. Its progress is rapid; in two or three days the testicle has attained its maximum size, three or four times that of its fellow. The scrotal veins are prominent and tortuous, the skin œdematous. Hard, resisting, with smooth surface, the tumour forms a regular mass, in which the testicle and epididymis are completely blended. The tunica vaginalis usually encloses a little fluid.

The pain is continuous, or intermittent, and accompanies the rises of fever. Whether localised, or propagated along the cord, it is extremely severe.

The acute period lasts only a few days, only two or three if quinine be taken. Then comes defervescence, the temperature falling rapidly under the influence of the drug. But with diminution of the tension of the scrotum, the action of the febrifuge ends. Three or four weeks are required for the gradual resolution of the swelling. At the same time the testicle is liable to more or less complete atrophy. Some induration of the head of the epididymis may remain.

M. Le Dentu has advanced the ingenious hypothesis that while orchitis, met with in patients the subjects of the malaria, may be an inflammation due to the malarial poisoning, there is another form akin to elephantiasis of the scrotum and due to a similar cause (*vide infra*). In other words, one form of malarial orchitis is an intra-testicular lymphangitis.

He first gives an interesting case of malarial orchitis in which the inflammation, here acute, was probably part of the malarial poisoning. A man, aged thirty-five, who had resided at Cayenne for about fourteen years, had had several attacks of intermittent fever. For about sixteen months he had been liable to attacks of pain in the testicles and spermatic cord of sudden onset, accompanied by swelling and effusion into the tunica vaginalis. After a few days these phenomena would subside, but the swelling remained to some extent. On examination of the patient, there was found induration and a very marked increase in size, not only of the testicle, but also of the epididymis; the swelling extended as far as the inguinal canal. There were several nodules recognisable

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sented several exacerbations or relapses, which, together with the accompanying fever, yielded rapidly to quinine.

along the epididymis and lower part of the vas deferens. These lesions were bilateral. There was a little fluid in one tunica vaginalis.

The co-existence of intermittent facial neuralgia of a quotidian type and yielding to quinine, seemed to confirm the diagnosis of malarial orchitis. Improvement set in as soon as the patient left Cayenne, and went on gradually without, however, leading to a complete cure.

The next two cases of orchitis in malarial subjects present very different characters as to their onset, etiology and clinical course. (1) A man, aged forty, an inhabitant of Surinam for the greater part of the year, had for several months had swelling of both testicles. The skin of the scrotum had gradually altered. It presented, slightly, the appearance of elephantiasis. Both the testicles were as large as a turkey's egg. In the epididymis, which was also swollen, large rounded nodules were felt. (2) A man, aged forty-eight, arrived from tropical America in 1885 with manifest elephantiasis of the scrotum. In 1868, 1873, and 1875 he had been treated for stricture, deep urethritis, &c. In 1873 the testicles were noticed to be enlarged. In 1878 the scrotum began to be the seat of those erysipelatous attacks, which are the usual prelude tc elephantiasis. With scarification the scrotum greatly improved. No change, however, took place in the testicles, which remained of the same increased size, the same ovoid shape, and gave the same remarkable feeling of hardness. An attempt was made to find the filaria sanguinis hominis in the blood or serum of this patient, but without success.*

M. Le Dentu looked upon the orchitis present in the last two cases as an elephantiasic induration of the testicles, complicated with a simultaneous or subsequent scrotal elephantiasis. He considers that the enlargement of the testicles which is found when the subjects of hydroceles who have lived in the tropics are tapped, and also seen in some cases of chylous hydrocele, show that this same alteration of the testicle may exist independently of all lesions of the skin.

Thus, in addition to the form of malarial orchitis which is characterised by an acute inflammatory attack and pyrexia, we must, according to M. Le Dentu, admit the existence of an affection of the testicle occurring in inhabitants of hot countries, characterised by considerable increase in size, by uniform induration, and by its chronic course; an affection which is sometimes accompanied by elephantiasis of the scrotum, and which sometimes remains entirely independent of it.

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* It will be seen that there is a possible fallacy in this case. As the patient was the subject of old stricture, &c.; as the testicles were noticed to be enlarged while the patient was under treatment for this; as the filaria sanguinis was not found, it is possible that it was a case of urethral epididymo-orchitis, complicated with scrotal elephantiasis, a view somewhat supported by the "ovoid shape" of the swelling.

The coincidence and clinical identity of elephantiasic hypertrophy of the testicle with elephantiasis of the scrotum prove, according to M. Le Dentu, without doubt, that they have a common origin from a similar lesion. Whatever be the cause of the elephantiasis, it is the lymphatic system which is primarily affected. It is a reticular lymphangitis, coming on in attacks of erysipelatous appearance until the day when chronic œdema and hyperplasia of the connective tissue show the presence of elephantiasis. M. Le Dentu considers that there is a striking resemblance between these attacks and those which characterise many cases of malarial orchitis. He inclines to the opinion that the latter is often an intra-testicular lymphangitis *à répétition,* and that elephantiasis of the testicle thus produced is really a chronic lymphangitis which may succeed the acute form or commence more insidiously.

Treatment.—Quinine, rest and suspension of the testicle are the chief points.

Gouty Orchitis.—**Two conditions** seem to me to have been confused under the above name. First, there is **orchitis proper,** and, secondly, there is **epididymo-orchitis**, in which the epididymis is involved primarily owing to one of those urethral discharges being present which may be met with in the gouty, and in which the testis is involved secondarily. This condition has been considered at p. 250.

Gouty Orchitis Proper.—This has been described under the head of "suppressed" or "irregular" gout; but Sir J. Paget, who has given us* an excellent account of the clinical characters of this orchitis, prefers to call it a form of "incomplete" gout—a term which implies that it occurs in persons in whom the gouty constitution, although present, is not so well marked as to produce a typical form of the disease.

A gentleman had acute orchitis, attended with all the usual signs, local and general. No history of injury, no sign of renal calculus nor of one having passed through the bladder and irritated the urethra, nor of inflammation of the prostate or urethra, could be made out, and it became necessary to look for some general or constitutional cause. The patient said he had never had any illness in his life, but mentioned that he had lately been annoyed with a pain in his heel which did not lay him up, and that not unfrequently on awaking in the morning he felt pains darting through his knuckles, and sometimes his fingers and toes felt rather stiff. Also he frequently had cramps during the night in the muscles of the calf and elsewhere; he had suffered too a good deal from indigestion attended with flatulence, and lastly he had been troubled with painful erections, which often disturbed him two or three times in the night.

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* *Brit. Med. Journ.*, 1875, vol. i.: "Three Lectures on the Surgical Aspects of Gout."

Sir J. Paget goes on to remark that though not one of these five or six things would be enough, if taken alone, to prove anything, yet their coincidence or quick succession was quite sufficient to show that the patient had a gouty constitution. Thus he admitted that some of his relations had been treated for gout, though he did not think that they had had it badly. Gouty orchitis was very prone to relapse, and was thus very tedious; it occurred in very sudden seizures, and not rarely it was transferred by metastasis from one testicle to the other.

Hunter (*Works,* edited by Palmer, vol. ii. p. 182) says: "I have known the gout produce a swelling in the testicle of the inflammatory kind, and therefore similar to the sympathetic swelling from a venereal cause, and having many of its characters." Under the term "sympathetic swelling" Hunter is referring to the epididymo-orchitis which we now know to be due to direct extension of inflammation from the urethra (p. 252).

Sir A. Garrod communicated to the Medico-Chirurgical Society (*Brit. Med. Journ.,* March 12, 1887) a paper, by Dr. Debout D'Estrées, of Contrexéville, on Gouty Parotiditis and Gouty Orchitis. Though the former condition was the one chiefly referred to, the author had seen two cases of gouty orchitis, which, resisting treatment, had subsided spontaneously on the appearance of gout elsewhere.

A very interesting contribution to our knowledge of gouty orchitis has been made by cases brought before the Société Médicale des Hôpitaux in 1885.* Several cases were brought forward proving the *bonâ fide* existence of gouty orchitis. The following seem its chief characteristics. The patients are usually over fifty, they have been subject to joint troubles, dyspepsia, laryngitis, or bronchitis of a gouty nature.* In two cases (one especially interesting as occurring in a medical man, M. Milliard) the onset of the orchitis was followed, a few days after, by typical acute gout of the metatarso-phalangeal joint of the great toe. The orchitis is acute, the testicle itself is primarily and chiefly affected, though in one case the epididymis was affected as well. The tunica vaginalis and the cord usually escape, though pain radiates along the latter. The pain is sometimes intense, at others only moderate. The swelling may be twice or three times that of the natural organ, as large as "three fowl's eggs," the "size of the fist." It is usually smooth, uniformly hard, and without any nodular outline.

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* *Bull. de la Soc. Méd. des Hôp.*, 1885, pp. 9, 17, 33.

The onset of the attack may be preceded by fatigue, or over-exercise. In one case† a patient, aged fifty-six, and markedly gouty, three weeks after fracture of his tibia, was seized with sudden acute pain in the left testicle. The next day this was more than doubled in size, the swelling being quite smooth, without any nodosities, moderately painful on pressure, affecting the testicle almost exclusively, the epididymis very slightly. Some days after the onset of the orchitis there came on a characteristic painful swelling of the right great toe. The orchitis, in spite of various treatment, lasted nearly four months.

The following interesting cases are well worthy of note. At one of the meetings of the Society mentioned above, M. Guyot brought forward a case of gouty orchitis. In June 1881 he was consulted by a man of about fifty-three for a swelling of the right testicle. M. Guyot assured himself that the prostate presented no alteration, that the cord was neither swollen nor nodular, and that there was nothing pointing to syphilis or sarcoma. The patient had previously consulted him from time to time for muscular pains, laryngitis, bronchitis and dyspepsia. In Nov. 1882, after a rather fatiguing walk, the testicle again swelled up, acquiring the size of "three fowl's eggs." A fortnight later the patient was seized with a severe attack of gout. In March 1883 he again consulted M. Guyot for a chronic arthritis of the right wrist. The testicle and epididymis were now found normal in shape and size, and not in the least indurated. Rest and belladonna frictions had been the treatment adopted.

The next case was communicated by Dr. Péchaud. The patient, aged thirty-six, on returning from a short walk, was seized suddenly with pain and swelling in the left testicle.

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* Ebstein has recorded a case of hydrocele and orchitis on the left side in a bedridden gouty patient.

† *Ibid.*, M. Latil's case.

his was doubled in size, and, together with the epididymis, in-urated and tender. There was nothing to account for the swell-g, no injury, and no urethral trouble. The prostate and cord ere healthy. Two days later very acute pain set in in the meta-rso-phalangeal joint of the right toe, accompanied by swelling, nsion and redness. It was evidently an attack of gout. On quiring into his history, it was found that the patient's urine as generally thick, his digestion bad. In four days the pain and velling of the testicle had notably diminished, and, a day later, e epididymis alone was a little indurated.

I am not aware of any opportunity that has occurred to ex-mine into the morbid anatomy of this affection. And this is not rprising, as the affection is not a fatal one. The above cases ave been acute or sub-acute in their onset. M. Gendrin (*Actes la Soc. de Méd. de Paris,* 2 Juillet, 1830) has recorded a very teresting case of a more chronic and different kind—*i.e.*, charac-rised by chalky deposit. The patient was in the prime of life, ith markedly gouty chalky deposits in the hands and feet. One the testicles was of the size of a fist, and presented a smooth velling as hard as wood, and evidently formed by chalky mate-al, at least on the surface. It was quite painless.

Treatment.—Locally this should consist of lead and opium or oracic-acid lotions, applied as hot as can be borne, the testicle eing kept well up in a suspender. The bowels should be ept fully open, all the patient's waste material got rid of, the et carefully regulated, the amount of nitrogenous material taken stricted, sugar and fats forbidden, and some such mixture as ot. iodid. gr. v, pot. citrat. gr. xx, aq. carui ℥j, taken every ur or six hours, and followed by a small tumblerful of water. At ght a grain of calomel, or, if needful, the following should be dered: Pil. hydrarg. gr. jss, ext. col. gr. jss, pil. rhei co. gr. jss, . juniper., ♏j, and in the morning some Friedrichshalle or unyadi Janos water.

Inflammation of the Testicle and its Immediate urroundings in Rheumatism. Rheumatic Orchitis. -The existence of this affection has been much disputed, suspicion aving naturally fallen on cases of "rheumatic orchitis," owing to e readiness with which rheumatism has been invoked to explain ifferent diseases of doubtful origin. Dr. Bouisson (*Montpellier léd.*, 1860, t. iv. p. 336, "Orchite Rheumatismale") was the first study this form of orchitis, and has been followed by the follow-g French writers: Vache, *Du Rheumatisme des Genitals*, Paris, 1868; Guilland, "Thèse de Paris," 1876; Dhomont, *Du Rheumatisme Aigu Polymorphe*, Thèse de Paris, 1880.

Two forms, acute and chronic rheumatic orchitis, have been described; it is doubtful if the latter really occurs, the former is extremely rare. The following case which M. Dhomont gives in his thesis mentioned above is a good instance of the acute form of rheumatic "orchitis." A man, aged eighteen, was attacked with rheumatism affecting several joints, pericarditis and pleurisy. On the seventh day of the illness, the scrotum became painful and the skin red. The left tunica vaginalis was found to be distended with a large quantity of fluid. In a fortnight it all disappeared. No alteration had ever been observed in the epididymis or testicle. This case seems to be typical of what may be expected in acute "rheumatic orchitis." It is a serous membrane which is affected, the testicle and epididymis not being attacked. I would refer my readers to the case already given (under ACUTE HYDROCELE), in which a healthy man suffered from acute pleurisy, pericarditis, and hydrocele.

Before a diagnosis of "rheumatic orchitis" is made, not only must any urethral or other cause be excluded, but care must be taken to distinguish neuralgic pains in the epididymis or testis, to which gouty and rheumatic patients are especially liable, from a supposed inflammation of the testicle.

The following is perhaps a case of "rheumatic orchitis," or rather epididymo-orchitis, with a small degree of acute hydrocele. It is recorded by Mr. W. J. Penny (*Bristol Med.-Chir. Journ.*, 1888, vol. vi. p. 49), and while the effect of the salicylate of soda used is striking, it is to be regretted that so few details are given as to any points in the patient bearing upon a rheumatic taint.

W. S., aged thirty-three, complained of swollen and painful testicles. He was married, and had five healthy children. There was no syphilitic, traumatic, gonorrhœal, or tubercular history. The patient denied having caught cold. Two days before, he had noticed that the left testicle was swollen and painful, and, the day after, the right. For a fortnight previously the patient had suffered aching pains about the body, and during the last week his hands* had become swollen and painful. The right testicle was enlarged and very tender, the left markedly so, being about twice its natural size. The epididymis on each side was enlarged, and so also was the cord. In each tunica vaginalis was a small quantity of fluid.

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* No information is given as to what joints were affected.

From the acute onset, the pain and absence of any of the usual causes, rheumatic orchitis was diagnosed. A purge was given, and gr. xv of salicylate of soda was taken four times a day. Five days later both testicles were smaller and less painful, the hydroceles had been absorbed, and the hands were better. In a fortnight the testicles had returned to their normal size.

Inflammation of the Testicle and its Immediate Connections in Acute Tonsillitis.—I propose to allude to this subject here, because, though it is a very rare condition, and has only been alluded to in England on a very few occasions, the relation between throat affections and diseases of the testicle has been discussed from the earliest times, and is at the present time recognised as established by continental writers. It is to French observers that we in this instance again owe most of our knowledge. M. Verneuil, in a paper entitled "Des Épanchements dans la tunique vaginale, metastatiques de l'arrière-bouche" (*Arch. Gén. de Méd.*, 1857), published two cases of acute tonsillitis in boys of ten and twelve, accompanied with markedly acute effusion into the cavity of the tunica vaginalis. In these patients there was but little pain, and cure took place spontaneously and rapidly; but in one, the subsequent development of the testicle was arrested, the size of this organ remaining one-third of that of its fellow. Dr. Joal (*Arch. Gén. de Méd.*, March 1886), collected seven cases, two of which occurred in his own practice, of tonsillitis complicated with epididymo-orchitis and acute hydrocele.*

The following are the chief conclusions arrived at by Dr. Joal: The *severity of the attack of the testicle* does not depend upon the intensity of the tonsillar inflammation, for all the cases in his paper were instances of superficial follicular tonsillitis, none of which went on to abscess. *Frequency.*—Dr. Joal looks upon these cases as "probably not excessively rare."† **Time of appearance and symptoms.**—Usually the testicular symptoms appear as the tonsillar ones are subsiding. In one the affection of the throat followed on that of the testicle. *Age.*—Most occurred in patients from eighteen to twenty-two—*i.e.*, at a period when the genital organs are active. One case was an exception to this, being a man of forty-nine; here the orchitis suppurated. The two boys mentioned by Prof. Verneuil were perhaps instances of genital precocity; in them the symptoms were very slight, the swelling appearing without pain or local reaction. One side only is usually attacked. In one case only was the mischief bilateral. The symptoms in adults are usually sudden in onset and acute, there being marked pain in the testicle, epididymis, cord, and loins, with much tenderness. Acute hydrocele is very common. The epididymis may be affected, but usually the swelling remains limited to the testicle. The duration is usually from fifteen to twenty days. Resolution is the rule. It will be seen that two cases have been mentioned, in one of which atrophy of the testicle, in the other abscess, followed on the orchitis.

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* Dr. Joal was careful to exclude other causes of inflammation of the sexual glands.

† Ten cases are given, but in three the acute tonsillitis was complicated with inflammation of the ovary. Dr. Joal points out that Dr. James and Dr. E. Gray (*Med. Times and Gaz.*, 1859 and 1860) published cases pointing to "sympathy between the tonsils and ovaries."

Pathology.—Dr. Joal does not believe in the physiological relationship supposed to exist between the tonsils and organs of generation, a view put forward by Harvey in 1849 before the Medical Society of London, and based upon a case which he had observed where atrophy of the testicle followed upon removal of the tonsils.* The same view was held by Chassaignac, who, in 1854, affirmed that in girls affected with hypertrophy of the tonsils the period of puberty was retarded. This view has also been put forward by Dr. James in his paper already quoted by M. Bertholle in his memoir (*L'Un. Méd.*, 1866), and by others. Dr. Joal adopts the theory, rendered increasingly probable nowadays, that acute tonsillitis is a specific infectious disease, and explains the tonsils, testicles, and ovaries being especially singled out for attack by the following arguments. The complication is very rare in old age and infancy; it occurs principally at an age when the tonsils, testicles, and ovaries are at their maximum of activity. These regions are the seat of physiological activity, and the least general disturbance suffices to lead a fresh flow of blood to the already over-vascular parts. The possibility of these complications being due to a rheumatic taint is not mentioned by Dr. Joal.

Epididymo-orchitis from Strain.—The occurrence of this form, without any direct injury to the parts, has been much disputed. M. Velpeau believed in it and explained it by violent pressure of the abdominal obliques upon the vas deferens. He attributed the chief action to those fibres which pass under the cord in its passage through the inguinal canal. M. Roux agreed with Velpeau. M. Duplay (*Arch. Gén. de Méd.*, 1876) published a number of cases where orchitis, supposed to be due to effort or strain, was due, in reality, to a deep-seated and overlooked urethritis, a sub-inflammatory condition of the prostate or neck of the bladder, &c. M. Delorme in a thesis (*De l'Orchi-Epididymite prétendue par effort*, Paris, 1877) adds to the above, masturbation, excess in coitus, ungratified sexual excitement. Somewhat later M. Duplay allowed that one must not be too absolute in denying the occurrence of orchitis from strain &c., and that while, in addition to the above causes to be excluded, other cases of supposed orchitis from effort are really tubercular, the latent taint of which is now brought out, he allowed that there were a very small number of cases in which an orchitis seemed to have really succeeded a very violent effort.

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* As this consequence of removal of the tonsils has been brought forward from time to time the following most pertinent fact may be noted. Mr. Hague stated (*Brit. Med. Journ.*, 1881, vol. i. p. 193) that while resident, in 1879 and 1880, in Zanzibar, where almost every native without exception has his tonsils removed in boyhood, he never saw a case of imperfect development of the genitals.

The following case (M. Pellier *L'Un. Méd.*, 1888, t. xlvi., p. 325) seems to support M. Velpeau's view, from the order in which the parts affected became painful. A man, aged forty-five, carrying some boxes downstairs, mistook the distance and took two steps at once, making an effort to retain the boxes; at that moment he felt a pain in the right groin, so sharp as to make him cry out. The next day he experienced a feeling of weight in the groin; the next two days this was replaced by pain which increased. Four days after the injury M. Pellier saw the patient. The cord was painful and the vas indurated, continuing the epididymis in the form of a resistant tube. The epididymis was painful and swollen, especially towards its tail, where it enveloped the testicle in the form of a cap. Tension was also present along the inguinal canal, where the skin, without any redness, is slightly swollen. Twinges of pain are felt as far as the lumbar region. The author believed that he excluded all the other causes of epididymo-orchitis. For a few days the symptoms increased, the testicle itself becoming swollen and painful. About a fortnight after the commencement the symptoms began to abate. Two months later the testicle was still a little enlarged, and the vas had not entirely regained its natural suppleness.

Another way in which during strain an orchitis may be set up is by sudden jerking upwards of the testicle by contraction of the cremaster. M. Terrillon (*Annal. des Malad. des Organ. Gén. Urin.*, 1885, p. 230) gives the following case of a testicle thus suddenly mounting to the external ring, becoming fixed there, and, later on, as the seat of atrophy and neuralgia, requiring castration. A patient, aged forty-five, while raising a bar of iron, felt a sudden pain in the left testicle, so acute that he fainted. There was no direct contusion, and no effusion of blood or bruising. The patient noticed that the testicle had mounted towards the groin; next day it was fixed in its new position, inflamed and enlarged. Symptoms supervened simulating localised peritonitis—viz., sickness, constipation, distension and tenderness of the abdomen. These lasted eight days; after three weeks absolute rest the testicular inflammation had mostly subsided, and yet the patient always experienced severe pain on moving. The testicle remained firmly fixed in front of the external ring, and was barely one-fifth of its natural size. It was so painful on pressure as scarcely to admit of examination. The thigh was flexed, adducted and rotated inwards, probably in order to relax the abdominal ring. As further rest for two months did not relieve the patient, castration was performed.

The testicle presented all the signs of atrophy after traumatic orchitis. M. Terrillon thinks that the testicle was here bruised, by the sudden contraction of the cremaster, against the external ring; contraction of the same muscle retained the organ there instantaneously, while inflammation of the adjacent cellular tissue served to keep it *in situ*. It is not stated in the account of the castration whether the testicle was much matted down. The fact that no epididymitis is mentioned perhaps favours the above explanation, this being a case of direct orchitis, and not of epididymo-orchitis, as in the former case, where injury was inflicted upon the cord by violent contraction of the abdominal muscles, inflammation being thus deep, and, later, reaching the epididymis and testicle.

There is another explanation of these rare but interesting cases of inflammation of the testicle and epididymis from strain. M. Guelliot (*Un. Méd. et Scient. du Nord-Est*, Juillet 1889), of Rheims, thinks that rupture of the spermatic veins, whether varicose or no, may take place during a strong effort, leading to extravasation of blood about the epididymis and so to pain and inflammation of that organ and the testicle. This view was put forward, a little later, at greater length by an American practitioner, Dr. E. Martin, of Pennsylvania (*Phil. Med. News*, Nov. 29, 1890). In his case epididymo-orchitis followed, it was said, a hard day's work. No ecchymosis is mentioned. There was no stricture or urethritis, and no pus or albumen in the urine. Dr. Martin holds that the spermatic plexus of veins is peculiarly under the influence of intra-abdominal pressure. Given a sudden and violent increase of pressure in these veins, it is quite possible that rupture may take place, even if the veins are healthy, but still more probably if they are dilated and weakened. Such rupture would take place in the cord, epididymis or testis. He supports this view by the frequency with which the left side is affected, the veins on that side being most frequently varicose. Thus, he quotes from a paper by Englisch, in which it is stated that out of seven cases the left side was affected in six, the seventh being bilateral. In his own case the mischief was on the left side. Furthermore, in his case, as would be expected, the pain was first slight, and gradually increased as more blood was effused and inflammatory symptoms developed. Dr. Martin quotes one of Englisch's cases as strikingly illustrating the probability of this theory. A labourer, aged nineteen, while working, suddenly felt a sharp stabbing pain in the left scrotum, at the same time there was a discharge of blood from the anus. Shortly after, the characteristic local and general symptoms of epididymo-orchitis developed. Here, owing to increased intra-abdominal pressure, there was increased pressure on the veins of the rectum and anus, and on those of the pampiniform plexus.

Section III.

INFLAMMATION OF THE TESTICLE ITSELF, OR ORCHITIS PROPER.

Orchitis usually occurs, as we have seen, in combination with epididymitis. Numerous instances of its originating in urethral mischief, or forming part of general disorders—*e.g.*, mumps and gout—have been given above. Much more rarely orchitis occurs alone, as after an injury, cold, &c. It may be acute or sub-acute, and may pass into the chronic stage. An orchitis which is chronic from the first is usually syphilitic in origin, and is described separately (p. 304).

It will be seen that acute or sub-acute inflammation of the testicle itself, or "testitis," as it might be called, is of rare occurrence compared with epididymitis or epididymo-orchitis.* The presence of a firm, dense, unyielding tunica albuginea, which not only surrounds the testis, but also, by means of the septa an fasciculi which are sent off from every part of its inner surface holds the delicate structure of this organ closely together, and th mobility of the testicle in its serous sac, are the chief explanation of the rarity of acute or sub-acute orchitis; while the greate frequency of epididymitis may be explained, not so much by it greater exposure, and by its lacking, save above, the protectio of a tunica albuginea, but by the fact that it is in mor intimate relation with the vas deferens, and thus with the urethra and so intercepts the course of inflammation which would otherwise reach the testis.

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* The word orchitis is applied very often and somewhat loosely to the condition which is really an epididymo-orchitis, in which the epididymis is first and chiefly affected.

Of the **pathology** of acute orchitis we know very little, th affection being very rarely fatal. The results of experimenta contusion of the testis in animals will be found alluded to in th chapter on injuries of the testis.

Causes of Acute and Sub-acute Orchitis.—These are bu few. Injury is the most frequent, such as striking the testis agains the pommel of a saddle, or against furniture, as when a patien makes his way across a dark room. Blows, kicks, and squeeze are other instances. This traumatic orchitis will be agai alluded to under Injuries of the Testis. Cold is another possibl cause of orchitis. The following case is given by Van Bure (*Genito-Urinary Organs*, p. 412): A young gentleman, in perfec health, one summer evening sat out upon the doorstep, and fel the cold stone through his trousers, as the testicles rested upon it The following day acute, true orchitis set in on the right sid and passed through its stages without suppuration. Complet atrophy followed. The swelling continued to decrease in size, unti nothing but the stump of the epididymis was left attached to th cord. The other testicle escaped. Afterwards this became th seat of epididymitis during the course of a gonorrhœa, but th swelling disappeared without harming the testicle in any way The patient afterwards married and impregnated his wife Inflammation of the testis is occasionally set up by prolonge and ungratified sexual desire. Mr. Bryant (*Surgery*, vol. i p. 163) gives the case of a man who came to him to ask fo castration, as he was impotent, owing to the stunted condition o his penis from hypospadias. He had "testitis" at the time fro ungratified passion. A very mild degree of the same thing i seen in the congestion, often giving rise to tenderness and aching which comes on in boys at the time of puberty, and lasts for few days or hours.

The cases of acute orchitis described as occurring in infants or young children are, I believe, nearly always cases of epididymitis or epididymo-orchitis. In very rare cases, if an infantile hydrocele become inflamed, a sub-acute orchitis will be present also. Syphilitic and tubercular disease of the testis in infants and young children are dealt with at p. 312.

The **results** and **sequelæ** of acute orchitis are the same as those already given as occurring after acute epididymo-orchitis of urethral or other origin—viz., atrophy, suppuration, &c. Atrophy is most frequently met with after traumatic orchitis. Suppuration is rarely met with. Billroth states (*Clin. Surg.*, p. 294), that while at Zurich he "met with nine cases occurring in men between twenty-one and sixty. The disease usually occurred in healthy subjects, and generally without known cause; in one case it followed a blow. Abscesses slowly formed in different parts of the parenchyma, filled with cheesy pus, and lined with spongy granulations. The process may go on for years without giving any pain. It usually leads to complete destruction of the testis without materially affecting the general condition. In two cases the disease had existed for twelve and fifteen years respectively." In two cases the largest of the abscesses was opened up, the granulations scraped away, and compression applied by strapping. The sinuses healed up, but the after-result is not known. In none of these cases had the patients any pulmonary disease, nor was there any history of gonorrhœa or syphilis. This form of chronic orchitis can often only be diagnosed by the history of the case: sometimes even by anatomical examination it cannot be distinguished from tubercular or syphilitic orchitis. Instances of such long-standing suppuration coming on without cause are quite uncommon in this country. It is far more common for the mischief to date to an injury. Mr. Shield (*Med.-Chir. Soc. Trs.*, vol. lxxiv. p. 77) quotes such a case from the *University College Hospital Reports*, 1887, p. 78. A man, aged fifty-eight, had repeated recurrent suppuration in the testicle for twenty-five years, after a kick from a horse. There was no syphilitic history. Castration was performed and an abscess was found in the testicle. Gaupail (*Arch. Gén. de Méd.*, 1831, t. xxvii.) gives a very similar case of orchitis and multiple abscesses following an exactly similar cause. When suppuration occurs, the pus, owing to the thickness of the tunica albuginea, is slow in making its way out. It burrows about in the gland, destroying its delicate tissue, and when it points it may do so at several places. More rarely the pus becomes encysted, forming a separate abscess. Sir A. Cooper (*Testis*, p. 11) considered that the difficulty of getting these sinuses to heal was explained by the fact that they give vent to seminal fluid as well as to pus. I have spoken at p. 261 of pyæmic abscesses occurring in the epididymis. The same thing may occur in the testicle itself. Mr. Shield (*loc. supra cit.*) gives the following case, which occurred in St. George's Hospital. A man, aged twenty-eight, was admitted into the medical wards for supposed acute rheumatism affecting the left shoulder. Swelling and pain in the right side of the scrotum supervened, and after death several collections of pus were found in the right testicle. Secondary abscesses were also present in the right lung.

Treatment.—Nothing need be added to the full account already given at p. 269, save that in those cases where, after suppuration, one or more sinuses persist (with or without a hernia testis), weakening the patient, and interfering with an active life, castration should always be performed.

SYPHILITIC AFFECTIONS OF THE TESTICLE AND EPIDIDYMIS.

These are uncommon complications of syphilis when compared with its other manifestations, and the more judicious treatment of this disease in late years has made them less frequent still.

The four following syphilitic affections present themselves in these organs for consideration:

(A) **ACQUIRED.** (i) **Syphilitic Orchitis, Syphilitic Sarcocele.** (α) **Diffuse, Interstitial.** (β) **More circumscribed, Gummatous.** (ii) **Syphilitic Epididymitis.** (B) **CONGENITAL.**—This is almost always a syphilitic orchitis or sarcocele.

(A) Acquired. (i) Syphilitic Orchitis or Sarcocele.

Pathology.—Syphilis here, as in the liver, shows itself in *two principal forms*, one diffuse, and the other more localised.

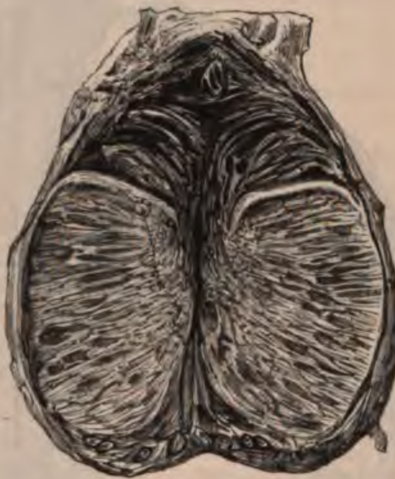
(α) **Diffuse Interstitial Orchitis.**—This is simply a chronic interstitial inflammation affecting the inter-tubular connective tissue, and usually also the tunica albuginea. Briefly stated, the mischief, if untreated, may be said to run through three stages: cellular proliferation, formation of fibrous tissue, and, then, contraction of this, which gradually strangles the testis, bringing about its atrophy.

To go more into detail. The earlier stages are congestion and

ght thickening of the intertubular connective tissue, and often
o of the tunica albuginea.* Certain parts only are affected at
t, but the whole of the testicle may be attacked ultimately.
e above congestion is followed by the appearance in the con-
ctive tissue, intertubular and perivascular, of crowds of nuclei-
e bodies or "indifferent" cells, arranged in lines along the
ota, or in irregular masses. A little later, these embryonic
ls become spindle-shaped,
d there is found an over-
owth of young connective
sue which, if left, becomes
ore and more fibrous. While
s fibrosis of the organ is
ng on, the walls of the
ssels and the seminal tu-
les are surrounded in the
ected districts by sheaths
cellular and fibrous tissue
med in a like way. By
s they are gradually ob-
ucted and wither. The
thelium in the tubules
ays and is shed. With
s diffuse condition, local-
d, rounded, yellowish
sses—*i.e.*, gummata (p.
8), varying in size and
mber, may exist.

To the unaided eye, a sec-
n of a testicle in the earlier
ges of diffuse orchitis has
t its yellow, soft appear-
ce. It is at first both
lder and harder than usual,
seminal tubes no longer unravel easily, then the organ becomes
ler, and increasingly fibrous and tough, the newly formed con-
ctive and, later on, fibrous tissue being now seen spreading
vards from the periphery of the organ towards the centre as
reasing bands along the lines of the septa. This is especially
ticeable in the rete testis and in other parts as more irregular

FIG. 42.

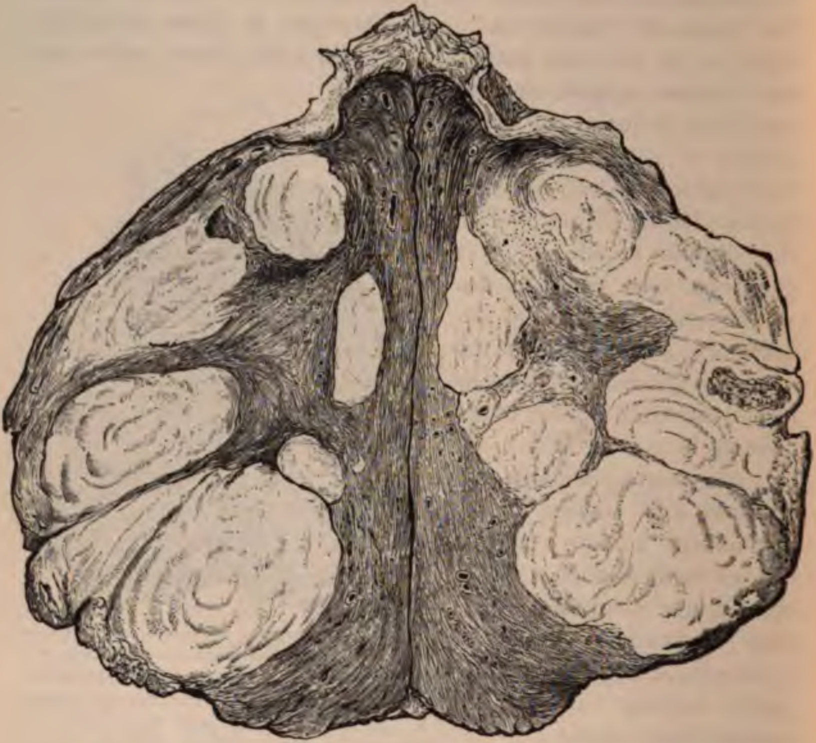


A testicle showing well-advanced syphilitic sclerosis of connective tissue among the tubules, these latter having completely disappeared. The greater part of the cut surface is yellowish, but was pink when fresh; it appears uniformly and finely fibrillated with a few patches of gummatous material. Microscopically, the greater part of the gland was found to be converted into fibrous tissue, without any distinct trace of tubules; the patches showing masses of granules, oil-globules and cholesterine. The epididymis is much wasted, and hardened. (Spec. 4199, Hunt. Mus.)

Thus accounting for the early appearance of hydrocele in some of the cases.

masses of young scar tissue. When the whole organ is affected, owing to the lobular segmentation which is normal to the organ, it may happen that the masses of newly formed fibrous tissue

FIG. 43.



Section of diffuse orchitis with well-marked gummata. In the centre, vascular fibrous tissue is seen passing towards the sides between numerous firm, yellowish, tough, nodular masses. These masses, arranged at the periphery of the testis, appear to correspond to fused and altered lobules, and to be now forming the early stage of gummata. On the right-hand side, which corresponds to the anterior surface of the testis, one of these nodular gummata is breaking down, and at this spot the scrotal coverings had ulcerated. Microscopically the gummata consisted of non-vascular, amorphous, granular material, in which neither cells nor fibres were distinguishable. The very vascular fibrous tissue which passed around, and, in many places, between the gummatous masses, was crowded with indifferent cells, and here and there enclosed tubes, containing caseous material. The patient had suffered from a node on the sternum. The specimen was shown by Mr. Eve at the Pathological Society (*Trans.*, vol. xxxi. p. 190), and is now in St. Barthol. Hosp. Mus., No. 2771.

take a somewhat conical form, the base of each cone lying towards and being continuous with the usually thickened tunica albuginea, while its apex is directed towards the mediastinum testis. This appearance is suggested in Fig. 43, though here the change is advancing from the earlier and diffused to the later and more intense or gummatous form of orchitis.

Whether the diffuse form of orchitis is alone present, or whether it is largely accompanied by the gummatous form, if the disease runs its natural course, untreated, the third stage, that of atrophy, follows. Usually this is brought about slowly and gradually, more rarely with great rapidity, the three stages taking but a few months. When it is complete the testicle is reduced to the size and feel of a haricot bean, hard but knotty. In the most advanced cases there seems absolutely nothing left of the testicle, the vas deferens ending in the epididymis, which is somewhat thickened.

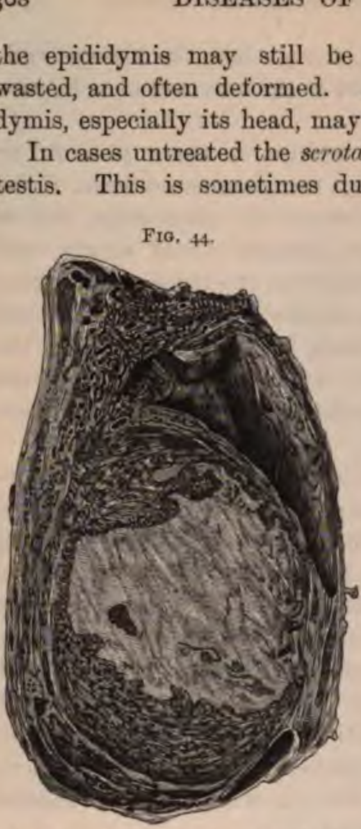
The condition of some of *the tunics and annexa of the testicle* require a little attention. The *tunica albuginea* is usually thickened by the formation of fibrous tissue, either partially and irregularly or uniformly. Owing to this, and its connection with the interstitial newly-formed fibrous tissue, it is increasingly difficult to separate the tunica albuginea from its contained parenchyma. Owing to the shrinking of the cicatricial bands, which are continuous with it, its surface may show puckerings at different points. Thus, a peri-orchitis accompanies the orchitis, much as hepatitis and perihepatitis are often met with together. Sometimes this periorchitis is more localised, and thus the tunica albuginea is rendered irregular by the presence of gummata.

The *tunica vaginalis* is also usually affected, this fibro-serous membrane being occupied over more or less of its extent by chronic inflammatory thickenings of varying thickness and density, while its inner surface may show false membranes. The frequency of hydrocele in syphilitic orchitis has been a good deal discussed. In many, if not the majority of, cases of interstitial orchitis by the time the testicle has attained to twice its natural size some fluid, usually small in amount, and of the ordinary yellow tinge, is present in the sac of the tunica vaginalis. This gradually disappears, and, later on, the two serous surfaces, thickened and altered, begin to adhere at different spots, and ultimately are united by fibrous adhesions hard to separate. In some cases complete obliteration is brought about by these synechiæ.

The *epididymis* and *vas deferens* are usually unaffected. The former may be somewhat concealed by the fibrous thickenings of the testis and its tissues, but, in most cases, even where the testis is in an advanced stage of sclerosis and atrophy, the epididymis may still be distinguished, though somewhat wasted, and often deformed. According to Virchow, the epididymis, especially its head, may be the seat of gummata.

In cases untreated the *scrotal tissues* become adherent to the testis. This is sometimes due to the softening of gummata on the surface of the tunica albuginea, a point referred to again under the heading of HERNIA TESTIS.

FIG. 44.



Vertical antero-posterior section of a testicle enlarged to three times its normal size, and injected. Its body is largely occupied by a mass of tough, homogeneous, yellow, gummatous material, in the midst of which patches of gland-tissue remain. Bands of organised lymph pass between the opposite layers of the tunica vaginalis. The epididymis is unaffected. From a sailor subject to enlargement of both testicles for three years. He had no trace of syphilitic affection. After the left testicle was removed the right returned to its normal size. (Spec. 4202, Hunter. Mus.)

(B) **Gummatous or more Circumscribed Orchitis.**—While this is, for the sake of convenience, described separately, it very often co-exists with the preceding form,* and when it appears at a later stage, it usually implies the previous existence of some diffuse orchitis, of which it is to be looked upon merely as a more localised and an intenser form, not as a distinct variety. As in the diffuse interstitial orchitis, the first stage is here, also, one of vascularity and embryonic-cell formation; but these cells, instead of being largely diffused throughout the connective tissue of the testicle, are here collected and localised, so as to form minute nodules, at first only to be recognised by the microscope, which tend to blend together and form gummata. In each form of orchitis there is the formation of embryonic and, to a certain extent, of connective and fibrous tissue. But in the gummatous orchitis this process is not only localised, but it is interrupted by the tendency which gummata have, here as elsewhere, to caseate, unless removed. The gummata are usually multiple and vary in size from that of a pin's head or a pea, to that of a hazel or walnut, or a bantam's egg. They are somewhat elastic and fleshy, softer towards their centre, dry and yielding no juice, owing to their slight vascularity. Their colour is yellowish-white or grey. Their structure, resembling that of other gummata, shows a central portion tending to caseate, being composed largely of fatty, granular débris. Around this a capsule of fibrous tissue, usually but ill developed from its little vascularity, may be seen, while, more externally still, a third zone, cellular and vascular, may be found in the gummata of younger date, and later on this is converted into the whitish fibrous capsule. In rare cases the epididymis may be the seat of gummata, which may here, also, soften, and leave fistulæ.

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* Where gummata develop independently of any diffuse orchitis, Lancereaux suggests that they may have started in the outer coat of a spermatic vessel, or in a tubule.

The Condition of the Tunics and Annexa of the Testicle.—The *tunica vaginalis* is usually thickened, and, owing to the later date of gummatous orchitis, its cavity is more or less obliterated. The *tunica albuginea* may be thickened and puckered, thus giving an uneven surface to the finger, or it may present here and there nodular swellings which are gummata, situated, if not in the tunica albuginea itself, at least so near the surface as to call for treatment, lest they soften and fungate (p. 43). The *epididymis* and *cord* are, as in the diffuse form, usually unaffected. But the following case of Lancereaux's (*Syphilis,* Syd. Soc. transl., vol. i. p. 276) shows lesions which, though uncommon, are of great interest. In a patient, aged forty, with syphilitic orchitis of the size of an adult fist, the cord formed a hard, rigid rod as big as a finger enlarged at several points, some of these enlargements, near Poupart's ligament, being of the size of a large chestnut. With potassium iodide the cord became supple, and of the size of a quill, the nodules which it presented becoming, ultimately, scarcely appreciable. The softening and breaking down of a gumma in the testicle will be described later under HERNIA TESTIS.

Terminations.—Syphilitic orchitis may terminate in one of the following ways, viz., (1) *resolution ;* (2) *atrophy ;* (3) *suppuration ;* (4) *fungation.* It will be seen that some of the above are more frequently met with after the interstitial, and others after the gummatous, but all are of great importance.

(1) *Resolution.*—Speaking generally, the earlier the stage in which the case is seen, and the healthier the patient, the more rapidly will the mischief subside with appropriate treatment. In

some cases the resolution, though not quite complete, is still satisfactory, the testis remaining somewhat hard and lumpy, but its function being restored. But the rapidity with which a large testicle will return to its normal state is sometimes very striking. A very interesting instance of this kind is given by Mr. Hutchinson (*Syphilis*, p. 270). A gentleman, aged twenty-five, had complete syphilis, he took mercury, and got well. He married at thirty-one, and had four healthy children. He kept his health till he was forty-one, when he had an enlarged liver. Soon after this he had a cough and expectoration, and became very thin. When he was forty-four he was sent to Algiers, being considered to be the subject of advanced lung-disease. On his return home, he was so ill that he was expected to die. Suddenly now, one testicle began to enlarge, and he came to Mr. Hutchinson with the testicle as large as two fists. Its disorganistion appeared to be complete, and it was so serious an encumbrance to him, that its removal was advised. Mr. Hutchinson states that he was especially influenced in this decision by the fact that the patient had taken much iodide, and was in very feeble health. The iodide had much benefited him, but had not materially reduced the enormous testis. Whilst waiting for the patient's decision, mercury was given. Improvement at once set in, and in a few months the testis had returned to its natural size, and all the chest symptoms had vanished. This case was in 1882, and its subject has been ever since in sound health. "A curious fact remains to be mentioned. Whilst under mercurial treatment, and when the testis first involved was rapidly diminishing, the other began to enlarge. It increased to a moderate size, and then again subsided. There can be little doubt that the preliminary lesions had here been of a syphilitic nature. The case carries with it a clear lesson that in all obscure diseases of viscera, in those who have at some former time suffered from syphilis, we ought to try the effect of mercury."

(2) *Atrophy*.—The pathology of this result follows on what has been said at p. 304. Atrophy may be said to be the natural termination of diffuse orchitis if untreated, the newly formed fibrous tissue ultimately sclerosing, and, like all scar-tissue, tending to obliterate intervening structures. This process is usually slow and lasts a year or two. In some cases it is far more rapid, atrophy being brought about in a few months. According to MM. Monod and Terrillon (*Malad. du Testicule*, p. 437) it is not uncommon in cases of syphilitic orchitis which

have lasted a year or more without causing diminution in the size of the testicle, for sclerosis to take place all at once, and to proceed rapidly to well marked atrophy. In another class of case where the degree of atrophy reached is partial, the testicle returning to about its normal size, but remaining here and there indurated and lumpy, it is probable that the formation of interstitial connective tissue has been partial also.

(3) *Suppuration.*—This may occur in either form of syphilitic orchitis, but at two very different stages. According to Mr. Hutchinson (*loc. supra cit.* p. 267) the earlier syphilitic orchitis occurs "the greater is probably the risk of suppurative inflammation." If it were not for the weight of authority and stamp of accuracy of observation with which any statement comes from Mr. Hutchinson, this one would seem unlikely, syphilitic orchitis, when it occurs early, doing so in young and usually healthy subjects. The above statement is quite contrary to the experience I have had of this disease, and it is not borne out by those cases which are recorded of early onset of orchitis in the course of syphilis. I should have thought that suppuration was much more frequent in the later stages of caseating, gummatous orchitis, when untreated in the cachectic broken-down subjects of tertiary syphilis. Ricord in fact went so far as to affirm that syphilis of the testicle never ended in suppuration. This opinion was, however, far too exclusive, it having been shown by several observers that gummata of the testicle may break down, discharge their contents, and then, what is of special importance, form a hernia on the surface. In other cases, though no hernia has formed, the resulting sinus is persistent and rebellious.

(4) *Hernia Testis.*—This, and the suppuration of a breaking-down gumma which precedes it, is becoming much less common than it was even twenty years ago. It may still be very occasionally seen in the cachectic subjects of tertiary syphilis, especially in those of strumous diathesis, and in those who have been exposed to want, or to lack of fitting treatment. Thus, breaking-down nodes, ecthymatous eruptions, ulcerations of the nose and palate, may be present at the same time. For further information the reader is referred to HERNIA TESTIS, p. 376.

(ii) **Syphilitic Epididymitis.**

By most writers on syphilis the epididymis has been considered to escape in syphilis. But this must now be held true of the tertiary period only (p. 309). Secondary syphilis occasionally brings about changes in the epididymis without affecting the testicle.

Dr. Dron, of Lyons, drew attention (*Arch. Gén. de Méd.*, 1863, t. ii. p. 513) to the existence of an epididymitis in syphilitic patients which may exist independently of any lesion in the testicle itself.* Sixteen cases were met with by this writer, in fourteen there was no lesion of the testis itself, in two, syphilitic orchitis co-existed. Of the sixteen, ten had never had gonorrhœa, and of the six others it was shown that, save in one case, gonorrhœa could not be at the root of the epididymitis. In addition to the absence of gonorrhœa, the chief characters of this epididymitis are its indolence and the usually painless condition, the hard nodular mass, of the size of a pea or a small nut, in the head of the epididymis, the presence of other evidence of secondary syphilis, and the yielding of the disease to mercury. M. Dron points out that this last point excludes tubercular epididymitis, and also that other causes of epididymitis are usually absent. Another important point is the date of the appearance of the epididymitis, this being, on the average, three and a half months after the primary lesion. In six of M. Dron's cases both epididymes were affected. This was the case in the only instance which has come under my notice. A man, aged nineteen, came to me in 1883 at Guy's Hospital for "a swelling of the testicle." The right globus major contained a nodular mass of the size of an olive, indolent and free from tenderness. The testicle itself was healthy. There was no urethral discharge. The left epididymis was also enlarged in its upper part, but to a less extent. There was a stain as of a chancre close to the frænum, the inguinal glands were amygdaloid, ulcers were present on the tonsils, and a dusky roseola was fading on the chest. The enlargement of the epididymes entirely subsided under the influence of mercury, and during the six weeks that the patient attended, no urethral discharge appeared. As this disease is so insidious, and tends to spontaneous cure, it is probable that it would be found more frequently if the epididymes were examined, systematically, in the subjects of early secondary syphilis.

Orchitis due to Hereditary Syphilis.

This is a rare affection, far more rare than tubercular disease at the same age. One of the first cases recorded was by M. Gosselin (*Union Méd.*, Nov. 4, 1858), in which a child of ten months with characteristic mucous patches around the anus had a hernia testis. A more usual instance was published by North (*Med. Times and Gaz.*, 1862, t. i. p. 403). Here, in an infant with inherited syphilis and covered with a specific eruption, the left testicle was as large as a pigeon's egg, weighty, and not tender to pressure. Under appropriate treatment the disease subsided in a few weeks.

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* M. Fournier (*Ann. de Dermatol. et de Syphilogr.*, t. vi. p. 224) has also observed eight well-marked cases of this affection. He has never seen the whole epididymis involved. The globus major, in his cases also, was the part characteristically affected.

In **Pathology** the disease appears to be a combination of the two forms of orchitis already described as occurring in the adult —viz., the interstitial and the gummatous* (p. 320). The testicle is hard, heavy, and free from pain or tenderness. If gummata are present near the surface, a shotty irregularity will be detected. The epididymis, vas deferens, and, usually, the scrotal tunics are unaffected, though when hernia testis occurs, as is the case very occasionally, the last are involved.

The chief importance of this disorder lies in the great risk there is of its being followed by atrophy, if untreated. And this risk is the greater if, as some believe, the disease is more disseminated throughout the whole organ, and runs a more regular course than in adults, in whom patches of the secreting substance are usually left intact, and in whom the progress of the disease is more irregular.† As bearing on this matter of atrophy M. Hutinel (*Rev. mens. de Méd. et de Chir.*, 1878) suggests that those cases of atrophy of the testis which are found in boys and adolescents, without any known cause, may have been due to congenital syphilitic orchitis in very early life.

The above remarks refer to affections of the testicle itself in inherited syphilis. While, as has been stated above, the epididymis usually escapes, Dr. Wilks, at a meeting of the Pathological Society (*Brit. Med. Journ.*, 1882, vol. i. p. 425), stated that he had seen in a little boy a considerable tumour of the epididymis, which had disappeared under the influence of mercury and iodide of potassium. As bearing upon *affections of the testicle in hereditary syphilis* the following instructive remarks are taken from a paper by Dr. Carpenter (*Pract.*, Sept. 1892): (1) The testicles may be affected so slightly in congenital syphilis that it needs the microscope to detect the malady. (2) In a certain small percentage of cases, the lesions of the testicle can be detected by physical examination. These lesions may be present at birth, arise soon after, or some months or years later. The general date, however, seems to be from birth up to two or three years, not much after this time, and very rarely indeed at puberty. Fournier's case of twenty-four years seems to be the limit. Syphilitic orchitis may arise when the patient is apparently thoroughly under the influence of mercury; but in this latter respect it does not differ from other syphilitic manifestations. (3) The testis is, more often than not, alone affected, but not infrequently the testis and epididymis suffer together, and, quite exceptionally, the epididymis is attacked singly. It appears from Burnstead and Taylor, that the cord may suffer, and in one of Obedenaro's cases it was as thick as a child's thumb. There is no record of the vesiculæ seminales and prostate being attacked. (4) The disease is very frequently bilateral in its distribution, though one side may be more advanced in pathological changes than the other. (5) Hydrocele is not so infrequently present as some writers would have us believe, and it may be, in young infants, the earliest indication that there is something wrong with the testicle. As time goes on the fluid is probably absorbed, and then the condition of the gland becomes more marked. (6) There is just a possibility that hydrocele of the cord may owe its origin to congenital syphilis. (7) The swelling of the testicle is a painless one, it feels like scirrhus; it may or may not be nodular, and a hernia testis is sometimes seen (Fig. 43). (8) The enlargement is not usually great, and there may be none at all, it being very rare indeed to find in infants or children a testicle the size of an egg. (9) In the large majority of cases the microscopical appearance is that of the simple inflammatory form, passing on to the development of fibrous tissue with consequent destruction of the gland, leading possibly, if not attacked in time by suitable remedies, to impotence and sterility. Certain atrophied organs may be thus accounted for. A scrotum of natural or almost natural size, containing an atrophied organ, the vas, vesiculæ, and prostate being free, and other evidence of congenital syphilis being present, would suggest such a causation. The inflammatory form is akin to that observed in the liver. Gummata, on the other hand, are rare manifestations.

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* Mr. Hutchinson showed at a meeting of the Pathological Society (*Trans.*, vol. xxxi. p. 192) a specimen of "gumma of the testis" from a boy, the subject of inherited syphilis. The organ was greatly enlarged and showed, on section, an opaque yellow growth, involving almost the entire substance. No softening had occurred.

† Another point of distinction between hereditary and acquired syphilis of the testicle is that in the former it is perhaps more common to find both sides attacked simultaneously.

Clinical Course and Symptoms of Syphilitic Orchitis.—The following remarks apply to the two forms of orchitis met with in acquired syphilis, the interstitial and the gummatous. Of those much rarer affections, the orchitis of congenital syphilis and syphilitic epididymitis, sufficient has already been said to enable the practitioner to detect them.

Causation.—Of this we knew next to nothing. It has been suggested that injury (Réclus), sexual excesses (Fournier), or previous inflammation, especially that of gonorrhœa (Ricord),* may prove the starting-point of syphilis in the testicle. I have no doubt that the first is here as elsewhere a *vera causa* in evoking latent mischief in some cases. The following is an instance to the point. In 1878 an architect, aged twenty-nine, came to me with the right testicle in a typical condition of syphilitic interstitial orchitis. It was of the size and shape of a jargonelle pear, weighty and devoid of testicular sensation, except at one spot in the upper part. Save for this the patient was in perfect health. Nearly three weeks before, he had struck his testicle while going up a ladder. No bruising or painful orchitis had been noticed, the swelling having come on insidiously and steadily. One year and three months before, he had had a hard chancre, "spots on his chest," and sore throat. It was doubtful if he had been treated with mercury, but if so, the course had certainly been short and inefficient. The mischief subsided entirely in three weeks under the influence of hyd. c. cret. and strapping.

As a rule, the syphilitic affections of the testicle are markedly insidious both in their commencement and early course.† There is usually but little pain or inconvenience, save a certain amount of inconvenience felt along the course of the cord, or in the loins, from the dragging weight of the testicle. In those cases, where the disease is detected early, the testicle feels merely a little firmer than its fellow. Nocturnal pain is, as a rule, absent. The scrotum is natural, both in colour and suppleness, except in the rare cases of hernia testis, p. 376. The epididymis can usually be made out distinct from the testicle, but in advanced cases it may be concealed by, or merged in, the swelling of the testicle. Hydrocele is often present in the earlier stages, but later on is absorbed, p. 307. In the interstitial orchitis the testicle is slowly changed into a pyriform or globular mass, the size of a hen's or turkey's egg, of an orange, or even that of two fists. In other cases it gives the impression of several large swellings, rounded off and somewhat elastic, in yet others the sensation of a much thickened and resistent capsule is very striking. The swelling is usually smooth, heavy and resistent, and devoid, in chief part at least, of the ordinary testicular sensation. In a few cases, and that in the earliest stages, the swelling is hyper-sensitive. This condition soon passes off, and the explanation of an exciting injury is always possible in these cases. In the gummatous form the enlargement is usually less, and the feel may be uneven or knotty, when one or more gummata are situated superficially (Fig. 43); but this is by no means always the case, and the same sensation may be given by an unequally thickened tunica vaginalis. Where the gummatous lesion is single or situated more deeply, the diagnosis must depend on the slight enlargement and increased resistance of the testicle, coupled with the history of other past or present manifestations of syphilis. Both testicles are often affected, but not, as a rule, simultaneously. It is very common when the disease has lasted for some time in one testicle, for the other to enlarge in like manner. The case quoted at p. 310 shows that this may take place soon after the first testicle is attacked, while the patient is still under treatment. Very much more rarely both testes enlarge at the same time.*

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* Mr. Hutchinson (*Syphilis*, p. 268) writes, "In cases (of syphilitic testicle) in which the vas is enlarged, examination should always be made as to the existence of stricture. Cases occur in which troublesome stricture and enlargement of the vas have preceded the orchitis, and in which the resulting disease of the testicle is of a syphilitic character. In these cases we may believe that the urethral irritation takes the part of an exciting cause, and brings out disease, which, but for it, might never have been developed. In such it is necessary to treat both the constitutional taint and the local cause."

† According to some French writers (Letourneur, *Bull. Soc. Anat.*, Juin 1862; Duplay, *France Médicale*, 1876, p. 173; A. Broca, *Gaz. Hebd.*, 1883, t. x. pp. 181, 183) syphilis of the testicle occasionally sets in so suddenly as to resemble an acute orchitis. In addition to the sudden increase of size, pain and redness of the scrotum are present. The pain usually lasts but a few days. But after some weeks the opposite gland may be attacked in like fashion. The absence of urethral discharge, or of any tendency for the swelling to soften, will help to distinguish this condition from urethral epididymo-orchitis, or from the occasionally rapid attacks of tubercle in this region (p. 344), while other evidence of syphilis should be sought for.

As the disease increases, venereal desire is lessened, and if both testicles are affected, impotence follows on sterility, this condition remaining permanently, if the disease goes on to marked atrophy.

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* I am speaking here of the interstitial form of syphilitic orchitis. In the later condition met with in tertiary syphilis where old-standing gummata and an atrophic fibroid condition are present, it is usual to find both testicles affected. Dr. Goodhart (*Path. Soc. Trans.*, vol. xxviii. p. 322) stated that "the majority of cases (38 to 24) of syphilitic orchitis found in the deadhouse occur in both the testicles."

According, however, to the extent to which one or both organs remain healthy, is the disturbance of the generative function less. Where treatment is early persevered with, however advanced the disease, the prognosis is good.

As to the date at which syphilitic affections occur, this is usually about the end of the second year after infection.* But the first appearance of the disease may be much earlier or later than this.

Diagnosis.—The chief diseases which it is possible to confuse with syphilitic orchitis are, tubercular disease, chronic orchitis, and malignant disease, especially that due to the slower forms of sarcoma. From *tubercular disease* the diagnosis should be easy if attention be paid to the following points. The history of the case; the fact that tubercular disease usually begins in and chiefly affects the epididymis, which in syphilitic orchitis is generally free; the tendency of the tubercular deposits to soften and involve the scrotal tunics in spite of treatment, while it is very rare, nowadays, for syphilitic orchitis to resist treatment and to cause a hernia testis; in tubercular disease the vas deferens is usually, and the vesiculæ seminales and prostate very often, affected; the tubercle bacillus may be found in the discharge from a sinus; in the one case, probably evidence of other tubercular deposits together with points that will help in the family history, while in the other, conditions that point to syphilis, will be obtained on careful examination. Finally, there is the result of treatment by drugs.

From *chronic orchitis*, if there be no history of an accident, and if the patient denies having had syphilis, the diagnosis will be much more difficult; here the tendency for the disease to attack both testicles may point to syphilitic mischief. Fortunately, while specific and non-specific orchitis may sometimes be difficult to distinguish, the same treatment is appropriate for both.

Between specific diffuse orchitis and the earlier stage of *sarcomatous testicle*. The history of syphilis (this may of course co-exist with malignant disease), the tendency of syphilis to attack both testicles; the steady, sometimes rapid, progress of sarcoma, the enlargement of the vas deferens, the varying degrees of softness and hardness met with at different spots on the surface of the growth—these will be the most helpful points. A specimen, No. 32A, St. George's Hospital Museum, shows well the difficulty which may be met with occasionally in the diagnosis of syphilitic disease of the testicle. It is labelled "Tumour of the testis of uncertain nature." The patient aged fifty-four, was admitted February 14, 1850, for an enlarged, heavy, and indurated right testicle, this being also very irregular on the surface. The spermatic cord was extensively nodulated and hard, as high as the external abdominal ring. The scrotum seemed to be adherent to the testicle. The disease was said to have commenced fifteen years before as a lump at the bottom of the testicle. The lump was painless and hard, but for some time did not increase. Five years later a hydrocele developed, which was tapped, and injected with port wine. The enlargement continued, and the condition of the cord, which had only appeared a few weeks before admission, gradually increased also. The swelling only caused a slight aching, and the general health was good. The patient was heard of as well eighteen months after the castration. The microscopical examination was thought by some observers to be characteristic of chronic inflammation, by others of carcinoma. The testicle here is not much enlarged, the chief cause of this being very marked thickening of the tunica albuginea and tunica vaginalis, especially below. Both in this pachy-vaginalitis and in the testicle itself are hard dry-looking yellowish masses which can scarcely be anything else than gummata. It is possible that the condition of the cord may have been similar to that in M. Lancereaux's case—*e.g.*, p. 309. The question of diagnosis is again referred to under the heading of NEW GROWTHS OF THE TESTIS.

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* Hutchinson, *Syphilis*, p. 267. In the debate on visceral syphilis (*Path. Soc. Trans.*, vol. xxviii. p. 313) this observer stated that the period at which the testicle was usually affected stood about midway between the disappearance of what are commonly accounted as secondary symptoms, and those counted as tertiary.

Prognosis.—We have seen (p. 316) that this is good if appropriate treatment is begun early and persevered with. Even when the disease is advanced, of old standing, with softening gummata, and even when fistulæ have led to hernia testis, the careful use of specifics will bring about a healed condition of the parts. With regard to the function of the organ, save in the worst cases there is always a chance that well-directed treatment may restore some secreting power, on account of the possibility of patches of secreting tissue having been left unattacked. On the other hand it must not be forgotten that though such healthy patches may remain, the fluid they secrete may be prevented from escaping by mischief further on—*e.g.*, in the rete testis. However, it is only when both testicles have been allowed to go into a condition of atrophy that sterility can be said to be certain to ensue. As a rule, even if the testis remains still somewhat hard and lumpy, the generative function is restored by treatment, fertile semen is again formed even when for weeks with double syphilitic disease, all venereal desire has been abolished. French writers have given ingenious explanations of this fact, some have followed Virchow, in his belief that some of the seminal tubules throughout preserve their integrity, even when the disease has involved the greater part of the gland. According to M. Réclus the restoration of function is due to part of the testicle remaining healthy, the secretion being checked for a while by some syphilitic lesion of the body of Highmore, for instance, which disappears under treatment. Others again—*e.g.*, MM. Monod and Terrillon—believe that the glandular epithelium may be restored after being long altered.

Treatment.—All forms of syphilitic disease of the testicle are most amenable to fitting treatment intelligently persevered with. The earlier the case, the more interstitial the orchitis, the more marked the need for mercury. Amongst the forms best and longest taken, hydrargyrum c. cretâ in doses of one grain, with or without a grain or a half of Dover's powder, and taken every six, four, or three hours, stands first. The old-fashioned calomel and opium (cal. gr. ½ or 1, pulv. opii, gr. ¼) is most reliable when taken once or twice a day in pill. The above will be found more convenient forms in private practice than draughts, or inunction, or the vapour bath, and are also more easily regulated and of gentler action. The simple rule of giving the drug in small doses frequently repeated should be followed; purging will be prevented by this, and by the patient abstaining from all fruit, green vegetables and coffee (Hutchinson). Where the tertiary stage is well marked, and where a gummatous orchitis is present, potassium iodide may be preferred. This may be given in some such form as pot. iod. gr. v–x, spir. ammon. arom. ʒss, ext. sars. liq. ʒj, aq. ℥j, t.d. The quantity of iodide may be increased, if needful, up to 20 or 30 grains, and these large doses are, I think, best taken in the American method, freely diluted in milk. But with regard to these doses it must always be remembered that they are only to be employed when the patient is clearly tolerant of smaller ones, and that even when tolerance is established, it may be wiser to substitute a smaller dose of another or different iodide instead of giving increasing doses of the same. For the subjects of gummatous testis are just those to be powerfully depressed* by large and continued doses of iodide.

Whenever a case of syphilitic orchitis, even if markedly gummatous, resists the iodide; where this drug is attended with much depression; or in cases where it is important to obtain a rapid result, the iodide and mercury should be combined, or the latter alone given. As an instance of combined or mixed treatment, the following may be tried: Pot. iodid. gr. v, liq. hydrarg. per. ♏lxxx, infus. quass. ad ℥j.

Bark, steel, cod-liver oil, wine, or good malt liquors are always to be recommended when potassium iodide or mercury are found depressing. Sea air will often aid specifics in clearing up the effects of syphilis here as elsewhere.

In the interstitial form much benefit may be gained by strapping the testis. This may be done over lint spread with ung. hydrarg. co., but Leslie's pliable Holland-strapping, if carefully applied as directed at p. 273, is quite as efficient and far more cleanly.

Any hydrocele which persists, which is very rarely the case, should be tapped.

Two cautions may conclude this account of syphilitic testicle. One which should always be present in the mind of a surgeon treating syphilis, and that is, not to leave off treatment too soon, but to persist with it for some time—*e.g.*, one or two months—after the testicle has regained its natural condition, and then only to give it up gradually, for fear of a relapse. The other is that a testis, the site of chronic induration and enlargement, should never be removed, until specific remedies have been honestly and perseveringly tried.

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* "I have known not a few cases in which patients thought themselves to have been permanently damaged by prolonged use of the iodide, and in many I have suspected that such was the case, although the patient did not himself suggest it" (Hutchinson, *Syphilis*, p. 302).

CHAPTER VI.

TUBERCULAR DISEASE OF THE TESTIS AND ITS APPENDAGES. TUBERCULAR EPIDIDYMITIS. TUBERCULAR TESTIS. TUBERCULAR ORCHITIS. TUBERCULAR SARCOCELE. PHTHISIS TESTIS. STRUMOUS OR SCROFULOUS DISEASE OF THE TESTIS. SCROFULOUS ORCHITIS.

OF the above terms the first, though somewhat long and clumsy, is the only one that is sufficiently accurate and inclusive.

I have not space to give here the very numerous views which have been held on the relation of grey to yellow tubercle, the importance of giant-cells, &c., in tubercle of the epididymis and testis. Tubercular disease here has gone through the same changing phases of belief as tubercular disease in other parts. The discovery of the bacillus by Koch has furnished a pathognomic distinction,* and has shown that tubercular lesions once started in the testis are the same as elsewhere. More important questions still awaiting answer are: How do the bacilli reach the epididymis and testis? Is the disease most often a primary one of these parts, or does it more usually extend to them from elsewhere? On this point there are two distinct camps of opinion, one maintaining that the tubercular mischief first breaks out in the epididymis and testis, and thence extends to other parts—viz., prostate, vesiculæ seminales, bladder, and kidney; the other, that the disease in the epididymis is secondary, the bacillus reaching this organ from some spot more remote in the genito-urinary tract—viz., the kidney or bladder.

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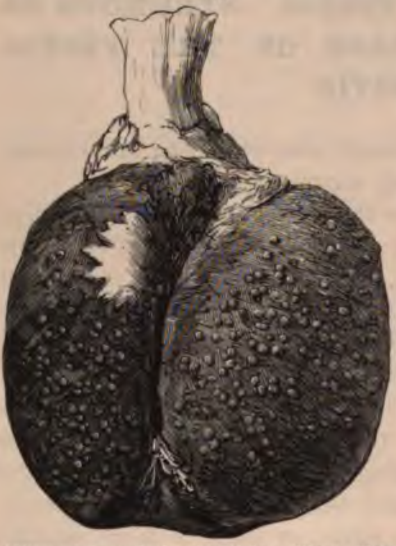
* In the words of Prof. Ziegler (*Pathol. Anat.*), while the old definition of tubercle was "a non-vascular cellular nodule, which does not grow beyond a certain size, and which at a certain stage of its development becomes caseous"; the new definition will run as follows: "a non-vascular cellular nodule containing the specific tubercular virus, the bacillus tuberculosis of Koch."

There is sufficient evidence to show that the testicle and its appendages may become the seat of chronic tuberculosis in one of any of the following ways. The acute form is described at p. 344.

I. The most frequent and that most usually described. *The epididymis is usually the first seat of the tubercular affection.* In a few cases it is the testicle which is first attacked. The mischief is usually chronic, but occasionally assumes an acute form. From the epididymis and testis the mischief will extend to other parts of the genito-urinary tract—viz., the prostate and bladder. This may be looked upon as a rule to which there are very few exceptions. The surgery of the future alone will show whether earlier and more energetic treatment, with a view of treating the primary deposit in the epididymis as ultimately malignant and fatal in nature, will give better results.

FIG. 45.



Miliary tuberculosis of testicle. (Prep. E.E. 24^2, St. Thomas's Hosp. Mus.) (Osborn.)

II. *As a chronic deposit of tubercle in the epididymis and testis, secondary to tubercular mischief in other parts of the genito-urinary organs — e.g.,* prostate and bladder.

III. Rare, of but little surgical interest. The epididymis and testicle (usually the latter first) are affected as *part of a general miliary tuberculosis.* (Fig. 45.)

I purpose to pay attention chiefly to the first of the above as it is the most frequent of the different ways in which tubercle attacks the testicle and its appendages, and because it is also the one in which most can be done by the surgeon.

But before any of the above varieties are considered there are certain points which bear upon the tuberculosis of these organs, however it may start—points which have only come up for discussion of late years, and which, though by no means cleared up, cannot be entirely passed over here. Amongst them is the probable mode of entrance of the bacillus, and whether we know of any conditions which predispose to and favour its entrance. Such a question is, it seems to me, of more importance than those which are usually discussed at such length—viz., whether the mischief begins within the tubes themselves, or in the intra-tubular connective tissue, &c.

Mode of Entrance of the Bacilli.—I think it may be taken for granted that as the bacillus is itself non-motile it reaches the testicle and its appendages most frequently by the blood-vessels, other, but rarer means of entrance, being by the lymphatics or directly along the seminal tract.

Is there any explanation of the frequency with which the epididymis is in a large number of cases first attacked? Two suggestions have been made here. Saltzmann believes that the frequency with which the epididymis is the primary seat of the mischief is explained by **the peculiarity of its blood-vessels.** These, he considers, are smaller and more tortuous than those in the testicle and vas deferens, and thus the vessels are important factors in determining the localisation in these parts of bacilli floating in the circulation. Perhaps also the fact that the spermatic artery breaks up, opposite to the epididymis, into two main branches, one for the epididymis and one for the testicle, may aid this. The very small size of the mouth of the spermatic artery, where it arises from the aorta, may account for the small number of bacilli which enter it when they are floating in the general circulation, and the difficulty met with in finding them in tubercular deposits, however characteristic, in the epididymis and testicle.

Another possible means of entrance of the bacilli into the epididymis—*i.e.*, by the **vas deferens**—must by no means be lost sight of. Since it has been shown that the mucus of the uterus and vagina may, in uterine tuberculosis, contain the characteristic bacilli it has been suggested by several writers—*e.g.*, M. Verneuil—that it is possible that **infection** may take place **during coitus** (*Gaz. Hebd.*, 1883, p. 225). The arguments of the above French surgeon in favour of infection by sexual intercourse are as follows: Cases occur, of which he quotes one, in which, in a perfectly healthy patient with nothing in his personal or family history to point to tubercle, a gonorrhœa was followed by epididymitis, the epididymitis becoming tubercular, and fistulæ forming. Again, general tuberculosis attains its chief maximum during the time of activity of the sexual organs, or in those years in which sexual intercourse is most frequent. It opposes no obstacle to this intercourse. This is certainly true of the earlier periods. The fact that tubercular foci are limited to the deep parts of the genital organs of the two sexes, and are not met with in the superficial ones, in no way interferes with contagion by coitus. Thus, in the female, nothing prevents tubercular matter which has accumulated in the uterus and Fallopian tubes descending and mixing with the vaginal secretion. So, too, in the male, the semen at the moment of ejaculation may bring away with it infective débris from the prostate, vesiculæ seminales, &c. In answer to the objection which may be raised as to why do the bacilli avoid the superficial parts—*e.g.*, fossa navicularis—and lodge in the deep, in this way behaving so differently to the microbes of gonorrhœa, M. Verneuil replies that the two diseases are quite distinct, the one acute, rapid, and phlogogenous, altering what it comes in contact with; the other advancing slowly and insidiously. Further, the anatomy of the parts explains the above in a measure. The immunity of the vagina is readily accounted for by its thick epithelium and its comparatively few glands, a condition very different to that presented by the uterus. In the male the prostatic urethra shows a number of gland orifices and the ejaculatory ducts. When these latter bifurcate, one passage leads into a *cul de sac* filled with viscid fluid, which is likely to arrest everything in its passage, the other to a long, flexuous canal, with fluid in it moving very slowly.*

To return to our point of infection of the male with tubercle by sexual intercourse, there is no doubt that several cases of chronic inflammatory mischief of the female genitals have of late years been shown to be tubercular in nature, and that the near future will show a still larger number of cases which under a less perfect method of examination in the past would have been reported as syphilitic or malignant. As instances, the following quoted by Professor Senn (*Princ. of Surg.* pp. 537, 539), from German sources, may be given. Zweigbaum reports a case of primary tuberculosis of the portio vaginalis uteri which appeared in the shape of an ulcer the size of walnut, with thick, indurated margins, and cheesy floor. Numerous tubercle bacilli were found in the secretion taken from th surface of the ulcer. An interesting case of primary tuberculosis of the Fallopian tubes has been recorded by Kotschau

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* On this point, Strümpell, from a careful examination of four cases of primar tuberculosis of the bladder in the male, came to the conclusion that infecti takes place through the urethra. The tubercle-bacilli finding no favourab place for settling and growth in the urethra and bladder, finally reach the prostate and epididymis. The whole process thus resembles what occurs in inhalation-tuberculosis, in which the disease manifests itself not in the muco s membrane of the bronchial tubes, but in the parenchyma of the lung apices.

The patient, aged forty-five, with a good family history, had suffered for a year with profuse metrorrhagia and pains in the abdomen. Vaginal examination disclosed a firm, smooth, movable swelling as large as an apple, to the right of the uterus; this was taken for a malignant ovarian cyst, and laparotomy performed. On opening the abdomen a quantity of turbid purulent fluid escaped. The swelling could not be removed on account of its intimate adhesions. The patient died from shock. The necropsy showed the right tube to be tortuous and generally thickened. Near its distal end it was dilated into a swelling the size of a hen's egg, in the centre of which was a cavity containing cheesy material. Other small, caseous foci were found in the tubal wall in close proximity to the large swelling. The right ovary was transformed into a caseous mass. The left tube and ovary showed similar but less extensive changes. Microscopical examination confirmed the diagnosis of tuberculosis. Numerous other cases might be quoted. I have been speaking of the possibility of a man being directly infected during sexual intercourse, but the reverse of the shield must not be forgotten. Thus, Barbier believes that a woman can be infected by a tuberculous man during coitus, as bacilli have been demonstrated in the semen of tuberculous patients.* Jonin goes further, and thinks that tubercular endometritis from local infection is quite a common affection. He believes that he has seen nine cases in which it was due to sexual contact with men suffering from genital tuberculosis. The experiments of Cornet are of interest on this point. By rubbing a pure culture of tubercle-bacilli into superficial abrasions of the penis in dogs he produced a tubercular lesion of that organ. It is suggested that tubercular lesions in the vagina or os uteri would in like manner endanger the penis. In bitches, tuberculosis of the vagina and uterus could be produced by injection of a pure culture into the vagina. Another argument in favour of tubercle being transmitted by coitus is the frequency with which, in a great number of cases, tubercular lesions remain for a long time limited to the epididymis and testicle. It is therefore argued that it is highly likely that a tuberculosis, so localised, should have a local origin. The observation of Babès is also adduced. This observer found tubercle-bacilli in the urine which, escaping from the bladder, would leave them on the mucous membrane of the urethra, from which the semen might carry them away and deposit them in the female sexual organs.

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* As bearing on this matter the following is noteworthy. M. Soles (*Rev. Gén. de Méd.*, April 1892) thinks he has conclusively proved the possibility of transmitting tubercle to guinea-pigs by means of the semen of phthisical patients. He goes on to ask, if the semen of a patient, aged forty-five, and suffering for a long time from phthisis has such powers of transmission, what must be the case in more vigorous patients, of younger age, married to healthy women. Dr. Fox (*Rev. Journ. de Méd., de Chir., et de Obst.*, June 1892) quoted a case, which, besides giving similar evidence, is of importance owing to the fact that here tubercle was present in the sexual apparatus without giving any external sign. At the necropsy of a man affected with tuberculosis of the pharynx, larynx, lungs, and intestines, examination of the genito-urinary apparatus showed a small nodule of tubercle in the cortex of the kidney. The bladder was healthy. From the incised vesiculæ flowed a fluid rich in spermatozoa. Preparations of this showed several bacilli. The above writer remarks that while we cannot affirm that localised tuberculosis in one of the lateral lobes of the prostate is dependent on the presence of bacilli in the vesiculæ seminales, it appears not unlikely that implication of the prostate may be consecutive to the presence of bacilli in the semen. Whether this be so or not, here was a complete sexual apparatus, including the vesiculæ, which presented no anatomical sign of tuberculosis, and in spite of this the semen contained tubercular bacilli.

On the other hand, M. Réclus, a very high authority on diseases of the sexual organs, considers the above theory to be too full of difficulties to be accepted. He appears to doubt the frequency of tubercular lesions in the female sexual apparatus as a means of infecting the male organs. As tubercular lesions of the penis are very rare—there all will agree with him—he holds that the woman can only be affected with tuberculosis by the semen, and he doubts whether this is proved (see foot-note p. 325). He holds that tubercular patients are not addicted to coitus, and that if they were, the diseased state of the epididymis would block the escape of the semen. With regard to these objections they are certainly true of patients with advanced tuberculosis; and patients with long-standing disease of one epididymis or with bilateral disease, if only advanced on one side, are nearly always impotent. But this is not the case with patients in whom the disease is in an early stage, and we know now from the case given at p. 325, that the semen may carry bacilli, and that too in patients in whom the epididymis and testicle are, on examination, found to be healthy. Other objections on which M. Réclus lays stress are the fact that the bacilli are not found in the superficial but the deep parts of the sexual organs, and he goes on to ask whether it is likely that an organism which is non-motile should be able to make such long journeys, as to the epididymis, testis, prostate, vesiculæ seminales and to the uterus without being washed away by the urine. If my readers refer to p. 324 they will there find that Prof. Verneuil has adduced anatomical reasons which favour the bacillus thus attacking parts remote from its point of entrance during coitus. And with regard to the female organs it is clear that tubercle-bacilli, if deposited with the semen in the vagina, may be in a position to attack the uterus without any risk of being washed away by the urine. Finally, M. Réclus considers that many of the cases brought forward in support of the theory that the sexual organs can be infected by coitus are weak. Thus, in the case of women who are said to have obtained tubercular leucorrhœa or disease of their ovaries from their husbands, it is not always stated whether the latter had actually tubercular disease of the epididymis or testicle. This objection is, however, met by the evidence which I have already adduced that the semen may contain bacilli without any disease of the epididymis or testicle being apparent. At present the whole question must remain an open one. The following seems to me to weaken the theory. If it were a correct one, tubercular disease of the sexual organs should be more common than it is.

Predisposing Conditions.—On this point it must be confessed that we know little for certain. Possible conditions which call for attention are:—I. Hereditary taint; II. Injury; III. Mixed infection; IV. Venereal excitement.

I. *Hereditary Taint.*—By this we mean one of two things—(*a*) The tubercular mischief is really congenital, the child when it comes into the world actually showing evidence of tubercular mischief, this taint being as much inherited from his tubercular parents as any of their tissues. Owing to the non-development and scanty vascularity of the testicle in early life, this disease must be very rare. Giraldès is said to have met with a tubercular testis in a fœtus at term. Of sixteen cases of tubercular testis in infants met with by M. Jullien, six were in patients of less than a year old. But the most striking case of this kind with which I am acquainted is one reported by Dr. Dreschfeld, in which a child was born with a tubercular testis. At a meeting of the Manchester Medical Society (*Brit. Med. Journ.*, 1884, vol. i. p. 860) this observer showed sections from a testicle which, to the naked eye, presented the characteristic appearance of scrofulous changes. Microscopically the caseous portions consisted of detritus surrounded by embryonic tissue in which giant cells occurred. Sections stained by Ehrlich's method showed, in the embryonic tissue, the presence of numerous tubercle-bacilli. The testicle had been lent by Mr. Monks, of Wigan. A swelling was noticed at birth; its removal was proposed, but objected to by the parents. The child died of general marasmus at the age of six months. The removal of the testicle only was permitted, no further examination of the body being allowed.

(β) The term hereditary taint may also be used to mean that the tissues of the epididymis and testicle are poorly vitalised, and thus unable to resist the localisation of the bacillus, or to bring about their elimination. This will be especially likely to be the case, if these poorly vitalised organs have been the site of chronic obstinate inflammation to which they are especially liable.

And here the question of the relation of chronic inflammatory conditions of the sexual gland (by which I include the epididymis and testicle) to tubercular lesions may be referred to.

In other words, is there any condition of the sexual gland which is capable of producing caseating patches which are not actually tubercular? Is it possible for a gonorrhœa, or an injury, to leave behind it patches of chronic inflammatory deposits without bacilli, and, therefore, not tubercular, which shall break down, suppurate, and form fistulæ, and yet, because they do not contain bacilli, remain, from first to last, non-infective? Thus, in another part of the genito-urinary organs, there is much reason to believe that a phimosis of long duration, repeated gonorrhœa, urethritis, and stricture—allied conditions which have two features in common, that of obstruction to the outflow of urine, and that of production of spreading inflammation—may set up changes in the pelvis and glandular tissue of the kidneys, leading to caseation and softening which are indistinguishable from those of tuberculosis, save in the absence of the bacillus. And here we are met by a difficulty to which I have referred elsewhere (p. 323)—*i.e.*, the scantiness with which the bacillus is met with in tubercular lesions of the genito-urinary organs.*

With regard to the testis, I think the case is different from that of the kidney, as obstructions to the outflow of its secretion, a very fertile cause of chronic inflammation, are not common.

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* It is well known how difficult it is to prove the existence of bacilli in tubercular affections of the genito-urinary organs. The epididymis and testicle are no exceptions. On this point, MM. Cornil and Babès (*Les Bactéries*, p. 442) write as follows: "Dans la tuberculose des organes génitaux de l'homme, les bacilles sont rares. Dans les tubercules caséeux du testicule, de la prostate, et de l'épididyme il peut arriver qu'on n'en trouve point. Dans un fait de tuberculose caséeuse du testicule enlevé par Richer, il n'y avait pas de bacilles dans le testicule, mais seulement dans une petite cavité qui correspondait à une coupe du canal de l'épididyme; il y avait là deux bacilles seulement dans les nombreuses preparations que nous avons examinées."

Other causes of chronic, or, possibly, pre-tubercular inflammation, such as gonorrhœa, injury, &c., here certainly, as a rule, run a definite course and clear up completely. If these, which are far less common than analogous causes in the case of the kidney, had the power of starting or running on into tubercular lesions, these latter would be much more commonly met with in the testicle and its annexa than is the case.

Again, tubercular lesions when they occur in the epididymis and testicle are extremely characteristic. Their, as a rule, insidious starting and causeless origin, the way in which they infect other parts, and lead to actual tubercular lesions elsewhere, their persistence from bad to worse, and the obstinate resistance which they show to well directed local and general treatment, is quite unlike the course of events which we should expect to follow on ordinary chronic inflammatory deposits devoid of any special contagium. The most that, in our present state of knowledge, I should be prepared to admit with regard to the relation of the results of chronic inflammation to tubercular mischief in the testicle and its annexa is, that the existence of previous inflammation may leave the mucous surfaces here, as in the case of those of the respiratory passages, predisposed to form a nidus for the bacilli of tubercle, in a way which could not have happened if no such inflammation had fallen upon them. Again, in a certain number of cases, a patient inheriting a tendency to chronic obstinate—*i.e.*, "strumous"—inflammations of his mucous membranes, if he come in the way of tubercular bacilli by living under circumstances of faulty hygiene may find that one or more of the above inflammations have become actually tubercular.

But in the very great majority of cases I believe that tubercular lesions here are tubercular from the first, though our knowledge as to how the bacillus gains access to these parts is very imperfect.

II. *Injury.*—There is reason to believe that in this we have a real cause of tuberculosis of the testicle and its appendages. While in most cases the patient, when he discovers, or has his attention drawn to the existence of a swelling, denies any history of an injury, there is a distinct proportion of cases which are traumatic in origin. Twice within the last two years I have seen instances of this kind. In one, a child of two-and-a-half, the mother had noticed "the lump" a few days after the child had knocked itself against the leg of a table. In this case the testicle and not the epididymis was the seat of the tubercle. In the other, a boy of twelve, the tubercular mischief had developed much more rapidly than is usually the case after a fall. The scrotum had been ecchymosed, and when, three weeks later, this entirely cleared up, a nodule was noticed in the left epididymis, which quickly softened. Castration was performed in each case.

M. Schoull gives a case of a patient of excellent personal and family history, who, while practising on the parallel bars of a gymnasium, bruised his testicle. As the pain and swelling and ecchymosis subsided the right testicle remained swollen, and gradually developed evidence of tubercular mischief.

The part played by the injury* is probably something of this kind. It so alters the tissues that they form a *locus minoris resistentiæ* to the bacilli which now find a nidus in them, or are arrested by them.

Whatever the exact part played by the injury may be, it is certain that a patient may have bacilli present in his circulation without giving rise to symptoms. If now some tissue or organ is injured, symptoms of tubercular mischief quickly arise, the bacillus being arrested by, or finding a nidus in, the damaged tissues.

The injury being slight is very likely to be forgotten, but to Volkmann we owe the important practical conclusion that severe injuries rarely cause an outbreak of tubercular mischief, the active changes set up in a tissue during its repair after a severe injury counteracting the propagation of the bacillus. On the other hand, where tuberculosis follows an injury, this is slight and may be insignificant.

III. *Mixed Infection.*—Here, again, on this, as a predisposing cause, we want more light. It is most probable that here, as elsewhere, a direct relation may exist between the invasion of two distinct microbes. Thus it is that the history of a previous gonorrhœa, especially if repeated in a delicate subject, may be of importance.† The gonococcus may so modify the mucous membrane of the genital tract—*e.g.*, by alteration of its epithelium—as to render easy the invasion of other microbes. The bacilli in the urine or the blood find their way to the vas deferens and epididymis, and here meet with surfaces already altered and impaired, and thus easily make their way into the deeper tissues, and so set up characteristic tubercular changes. This is only what happens elsewhere. In the same way a catarrhal lung inflammation, such as that often accompanying measles or scarlatina, may become tubercular in character, the bacilli present in the air, dust, &c., finding their way to a surface already weakened and prepared for their reception.

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* Chauveau thus showed that it was not the injury itself, but the alteration in the tissues which it brought about, which caused the localisation of the microbes. He found that the testicles of rams when crushed subcutaneously disappeared completely. If, before the crushing, putrid fluid was injected into the circulation, the injured organ became the seat of septic gangrene : this was not the case if the fluid injected was sterilised.

† In many cases it must be uncertain whether gonorrhœa really starts the

IV. *Venereal Excitement.*—With regard to this I need only point out that sexual excesses may, on the one hand, predispose to tuberculosis both by weakening the patient and by lowering the vitality, and, thus, the resisting power of the tissues of the sexual gland; while, on the other hand, when once tubercle has attacked these parts, the same excesses may in like manner hasten and exacerbate the course of the disease.

Morbid Anatomy.—This will include (i) **the naked-eye changes met with in the different parts of the male sexual organs,** and (ii) **the microscopical appearances.**

(i) **Naked-eye Changes in the Different Parts of the Male Sexual Organs.**—We must always bear in mind the existence of *three stages* here, especially in the case of the epididymis and testicle—viz., (1) That of *tubercular deposit;* (2) That of *caseation* and *suppuration;* and (3) That of *fistulæ.*

A. **Epididymis.**—In the earliest stages that come under clinical observation, a small painless nodule is noticed to have formed in the epididymis, usually in the head, to which the patient's attention is generally only drawn accidentally. A little later another similar nodule is noticed at another part of the epididymis. These little masses of deposit gradually run together and form an irregular nodulated mass, which, of somewhat crescentic shape, surrounds the testicle at its posterior and outer aspect. Later on, after a varying interval, one or more of these nodules caseate, soften, suppurate, and give vent to their contents by the well-known scrotal tubercular fistulæ. Now, in the morbid anatomy

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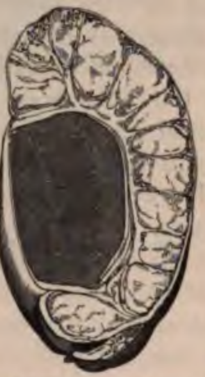
tubercular disease, or lights up some small and quiescent deposit into baneful activity. A specimen, 2782, St. Barth. Hosp. Mus., shows caseating tubercular material in the globus minor, and a hernia testis. The patient had contracted gonorrhœa about a year before admission, and the affection of the testicle dated from a short time after this attack.

of these tubercular deposits in the epididymis we are met with the following questions : (i) *What is their earliest stage?* (ii) *With what relative frequency are the epididymis and testicle attacked?* Is it correct to speak of the epididymis being attacked before and more commonly than the testicle? (iii) *What part of the epididymis is first affected?*

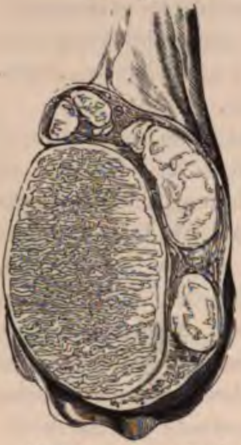
FIG. 46.



Tubercular disease of the whole of the epididymis. The testis is small, but appears healthy. The patient died of phthisis. (Curling.)

(i) *What is the earliest stage of the tubercular deposits in the epididymis?* Here we are somewhat in the dark, and our answer to the above question can only be given by guesswork and on evidence taken from what we know of the earliest appearances of tubercle in other parts. As these early deposits are in no way fatal lesions, we can only suppose that the first stage of these deposits is that of minute tubercles which gradually coalesce and form the larger deposits—*i.e.*, the later stage in which the disease comes first under our observation, for owing to the slightness of pain and trouble which accompanies this early stage patients do not seek advice until their disease has attained to a considerable degree of developement. It may be added, that though we have no actual proof that the mischief in the epididymis begins by small grey granulations, we are supported in this opinion by what occurs in the testicle. There is abundance of evidence to show that when the testicle is attacked, as it usually is, secondarily to the epididymis, and by an extension of the disease thence, the first stage of the mischief here is that of the above granulations.

FIG. 47.



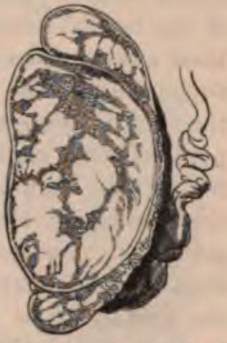
Epididymis containing several cretifying masses of tubercle. The body of the testis appears sound. (Curling.)

(ii) *The relative Frequency with which the Epididymis and Testicle are attacked.*—It is certainly a rule, to which there are very few exceptions, that, in the early stages of the disease, when patients first come under observation, clinical observation finds nodules in the epididymis only (Figs. 46, 47), and that this body is affected

›nly earlier, but to a greater extent, than the testicle. The
known law which Ricord laid down on this point will be
nbered, "whenever tubercles are met with in any part of
genital passages they will be present in the epididymis."
éclus (*Du Tubercule du Testicule*, 1876, p. 40) shows that
regard to the greater frequency with which the epididy-
s attacked, we must remember that the testicle may perhaps
nvaded, although the most careful clinical examination
ls no change. He further contrasts the results of cases
ed by post-mortem examinations with those where no such
vas obtainable.

thirty-four cases in which a post-mortem examination was
, tubercles were found in the epididymis and in the testicle
enty-seven cases, and in the epididymis only in seven cases.
the testicle as well as the epididymis were involved in
-fourths of the cases. On the other
twenty-two cases in which no autopsy
made gave the following result:—
rcles present in the epididymis and
le in ten cases, and in the epididymis
in twelve cases. Here both organs
attacked in less than half the cases.
e of the two tables, the first is the
reliable, it must always be remembered
the cases submitted to the test of post-
m examination were the older ones,
thus there had been more time for
lisease to spread from the epididymis
e testicle.

FIG. 48.



Testis as well as epididymis affected by tubercular deposit. The patient died of phthisis. (Curling.)

) *What part of the epididymis is first
d?*—This is a point which has been
and needlessly discussed. As a rule,
ead of the epididymis, the neighbourhood of the spot where
permatic artery divides and one branch enters the epididymis,
place where we most frequently find the first evidence of
cular deposit. But in other cases, and not a small number,
il is the part first affected. And as this is the part of the
lymis which is in closest relation to the vas deferens, it is
what we should expect to find, if it be correct that the
i find their entrance into the epididymis by the vas deferens
ll as by the spermatic artery (p. 323). Too much stress has
laid upon the part of the epididymis first attacked as a

means of diagnosis, many writers going so far as to say that tubercular epididymitis, especially that form which runs an acute course (p. 344) may be distinguished from epididymitis of urethral origin by its commencing in the head, while the latter starts in the tail. This is too absolute a rule. The evidence we want on this point is not only in what part of the epididymis the tubercular mischief first arises, but whether those cases in which the head is first attacked correspond to those which we should otherwise call primary—*i.e.*, those in which the epididymis is first attacked by means of the arterial blood supply; and with regard to those in which we find the first deposit in the tail, whether in these cases the mischief has reached the epididymis from the prostate vesiculæ seminales or urinary organs, cases in which, in other words, the epididymis is attacked secondarily.

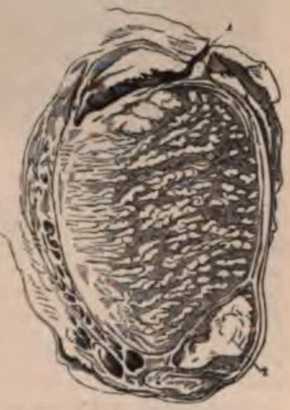
Returning now to the naked-eye lesions, and first to those in the epididymis, the deposits, as they are usually met with, appear as pale-yellow opaque masses in which only a few traces of the normal tissues are recognisable. As the disease advances these caseous masses soften and break down, usually with rapid suppuration. The tubes of the epididymis—which up to this time have been thickened, swollen, and distended with sero-purulent fluid, altered epithelium, fatty granular contents, and a few bacilli—now become further disintegrated, coils here and there becoming blended and lost, so that the epididymis is gradually converted into a mere bag of what would in former days have been called "scrofulous matter." The enlargement of the epididymis is due in the earlier stages not only to the presence of the above caseous deposits, but also to thickening of its capsule from chronic inflammation, this sometimes reaching the size of an adult little finger, and, later on, taking part in the general caseation. While caseation and softening are going on in the epididymis itself, the surrounding areolar tissue inflames, being infiltrated with serum and lymph, and thus preventing the free movement of the overlying skin. The softening and suppuration continuing, the skin, now violet-purple, becomes more adherent and thinned, the epididymis, now fluctuating and distended, resembles closely a "scrofulous" abscess elsewhere, and on its bursting or being opened, the ordinary sero-pus is discharged. The opening thus formed does not readily close, but continues a long time—for months or even years—to discharge a thin, turbid, watery fluid with now and then portions of cheesy or earthy material. While this is going on a track or channel with thick walls and feeling like a cord may be readily felt leading from the skin to the site of the mischief. The scrotal fistulæ and sinuses are often multiple, from one to four in number; they occupy the lower part of the scrotum usually, and have all the appearance of the openings of "scrofulous" abscesses. If one be laid open, the track is seen to lead into small cavities or larger caverns with ragged walls, containing ill-formed puriform matter and broken-down tissue.

Peculiar and Rarer Conditions in the Epididymis.—M. Réclus states that instead of caseous products the epididymis may, in part or whole, present a singular reticulum of alveoli, some of the spaces being empty and some filled with pus. He believes that such a network consists of dilated and thickened epididymal tubes.

In still rarer cases deposits of tubercular material, becoming in various proportions cheesy or calcareous, have been found occupying the cellular tissue outside the epididymis and end of the vas deferens. M. Gosselin has called these "eccentric tubercles," and suggests that they originate in the cellular tissue, or in the vas aberrans.

B. **Testis.**—Where the disease persistently makes head, or runs a very rapid course, the testis will suffer as well as the epididymis. In such cases we not only meet with caseous matter as in the epididymis, but with small yellowish-grey tubercular granulations as well. If these lesions are seen in an early stage, we find these granulations scattered about in the midst of the testicle parenchyma which has preserved its normal aspect and character; sometimes they are scarcely visible even in a fresh specimen, at others they just project above a cut section. They are usually arranged irregularly; at times they are grouped in linear rows (Fig. 49) as if converging towards the corpus Highmorianum. They are usually most abundant in the periphery of

FIG. 49.

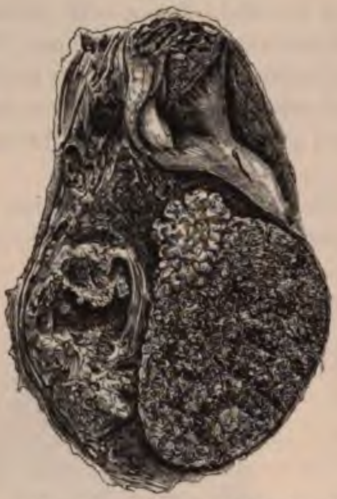


Tubercular disease of epididymis and testis. 1. Fistulous sinus leading to a suppurating cavity in the head of the epididymis. 2. Caseous matter in the tail of the epididymis. Isolated tubercles are seen in the body of the testicle, appearing more numerous towards the rete, where they coalesce and form closely set yellow lines.

the testicle; in the rete and deeper parts caseous masses, as in the epididymis, form the change most frequently met with.

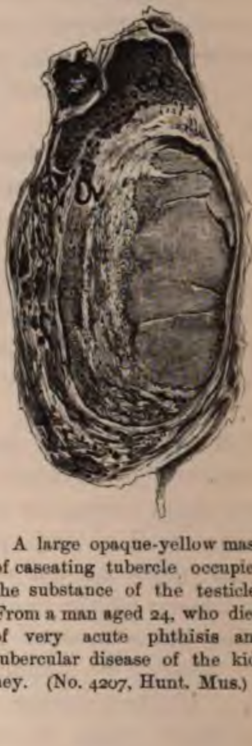
There may be some anatomical point, connected with the difference in the structure of the testis and epididymis, which accounts for the distinguishing feature that such tubercles are so frequently seen in the testis, but not in the epididymis. Perhaps, too, this is partly explained by the latent, insidious, painless character of their formation. Thus they are not noticed in the epididymis until they have become confluent in caseous masses of some size. By the time this has happened, the small grey granulations have formed in the testicle, though here the plump, elastic feel of the organ conceals such minute bodies while they are still separate.

FIG. 50.



Tubercular disease of epididymis and testicle. To the left the body of the epididymis contains a deposit of caseous tubercle, which has broken down. In the testicle, near to the mediastinum, is a firm mass of yellowish tubercle. From a patient aged 36, whose testicle became swollen after scarlet fever. For some months before he had been subject to continued urethral discharge, and had frequently suffered from cough and hæmoptysis. (Hunt. Mus. No. 4203B. Presented by C. Stonham, Esq.)

FIG. 51.



A large opaque-yellow mass of caseating tubercle occupies the substance of the testicle. From a man aged 24, who died of very acute phthisis and tubercular disease of the kidney. (No. 4207, Hunt. Mus.)

As the tubercles enlarge they become confluent, and so occupy and consolidate considerable portions, in some cases it may be the whole, of the glandular tissue of the testicle. Thus one or more lobes are found swollen with a yellowish-white, cheesy substance. These for a long time may remain distinct from each other, being separated by the fibrous septa which still retain more or less of their natural characters. Later on, softening occurs here as in the epididymis, and abscesses are formed which make their way through the tunica albuginea and superficial structures. Caverns are here also met with similar to those described in the epididymis, increased in size by the meeting of several foci which, softening, run together. The walls of these cavities are surrounded (according to its age) by a pinkish-white layer of sclerosed tissue, which shuts them off from the adjacent testicle structure. This isolation or localisation of abscess cavities is rather more common here than in the epididymis. Another sequela of abscess-formation may show itself in a protrusion of the altered substance of the testicle—a hernia testis—which forms a coarsely granulated mass, covered perhaps with soft white detritus, and presenting through an ulcerated opening in the scrotal skin (p. 376). The changes that have been described may go on, *pari passu*, in the testis and the epididymis, so that the glandular substance may be disorganised, and may appear through fistulæ in the forepart of the scrotum, while the epididymis is converted into abscesses which have burst through the hinder part and sides.

Rarer conditions than the above caseation and suppuration of confluent tubercles. There is another variety or *fibrous granulation* which is hard, being rich in fibrous rather than in cellular elements, and which is much less prone to caseate and soften (p. 351).

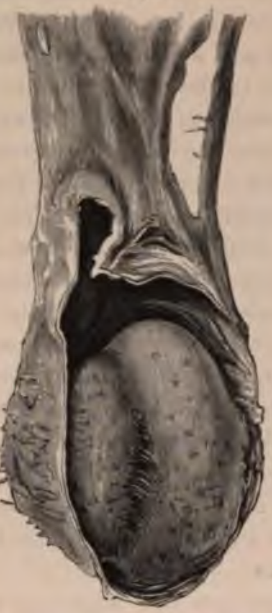
Another rarer condition is a more diffuse hardening and thickening of the gland tissue, met with over a considerable area, a proliferation and sclerosis of the connective tissue, which ends sometimes in complete fibrous transformation of the parenchyma.

C. **Tunica Vaginalis.**—This usually shows evidence of chronic inflammation. Thus it is unnaturally vascular, and its cavity may contain fluid, or be more or less obliterated. Any fluid present is usually small in amount, being rarely sufficient to form a hydrocele. At first it resembles ordinary hydrocele fluid, though even in this stage M. Réclus believes that it is distinguished by its unusual density, and the presence of floating fibrinous bodies.

Later on the fluid becomes sero-purulent, or is converted into thick, green pus. Tubercle bacilli have been found to be present in all these varieties of fluid.

A more frequent condition than the presence of fluid is the existence of adhesions. These usually obliterate the cavity partially, and thus limit small collections of fluid. More rarely the cavity is completely obliterated, it being difficult to separate the testicle from its coverings by dissection.

FIG. 52.



Tubercular disease with hydrocele. The left tunica vaginalis is laid open to show the position of the hydrocele. The epididymis (to the right) is very greatly enlarged; the testicle itself is not affected externally. The vas deferens is slightly thickened and blocked with caseating material. On the right side the epididymis was likewise enlarged with caseating material which had formed an abscess in the globus minor. The vas deferens was also blocked, but not much thickened. The testicle on this side contained several nodules of recent tubercle. The patient, aged forty-one, a valet, died of general tuberculosis. (Spec. 2780 B, St. Barth. Hosp. Mus.)

On the question of the existence of hydrocele, the following results published by Simon (*Deutsche Zeitsch. für Chir.*, Bd. xviii. § 157) are of much interest. This observer examined eight tubercular testes removed by castration from six patients, and four obtained at post-mortem examinations. In eight he found tubercular disease of the tunica vaginalis. In the remaining cases the disease was in a much earlier stage.

Simmonds, of Hamburg (*Deut. Arch. f. Klin. Med.*, Bd. xviii. §§ 153, 160), also showed that it was not uncommon to find evidence of tubercle in the tunicæ vaginales of tubercular testes, thus combating the opinion of Krebs, that the tunica vaginalis is very rarely attacked by tubercle, while the peritoneum is frequently involved.

Dr. Gerster (*New York Med. Record*, 1884, p. 1105) published the case of a patient, aged thirty-one, in whom severe compression of the testicle was followed by orchitis. This left a firm, painless, smooth swelling, which extended up to the external abdominal ring. Chills, night sweats, and emaciation followed. Castration revealed a very interesting state of the tunica vaginalis. This resembled a pulpy synovial membrane, being velvety and covered with granulations. The testicle contained a cheesy nodule. I have referred to a case at p. 374, in which, during castration in a child for tubercular testis, the patent processus funiculo-vaginalis was found to be covered with shotty granulations.

M. Tuffier (*Ann. des Malad. Gén. Urin.*, 1891, p. 701) found that the fluid removed from the liquid of hydroceles present in three cases of tubercular testis, and injected into the peritoneal cavity of animals, was followed by a fatal tuberculosis, though no bacilli could be found in the fluid.

D. **Vas Deferens.**—This is very commonly invaded. It may be indurated and enlarged to two or three times its natural size, its walls on section being found to be infiltrated, greyish, succulent, and its canal occupied by greyish-yellow pus. More commonly the cord is rendered irregular with nodules, which, dotted over a varying extent, leave between them healthy or less altered portions, a condition which has been described by some as "moniliform." Whichever form the disease takes in the vas deferens, whether uniform or moniliform, this tube is rarely effected in its whole extent. As a rule, lesions are found at two points especially. Thus they may be limited to the testicular end, ascending but a little way above the tail of the epididymis. In other cases they occupy (and it may be that both sets of lesions co-exist) the distal end of the tube close to its junction with the vesiculæ seminales, all the intermediate portion remaining clear. Two practical points result from the above: one that it does not at all follow that because the portion of the cord which can be felt between the finger and thumb appears healthy, that the disease is still limited to the epididymis and testicle; the other, that the condition of the vesiculæ seminales and terminal part of the vas deferens should always be cleared up by a rectal examination.

The following very interesting case of tubercular deposit in the vas deferens was recorded by Mr. Royes Bell (*Encycl. of Surg.*, vol. vi. p. 622). It is to be regretted that it is not more exactly stated whether this was really the only tubercular mischief in the genito-urinary organs. "In the Museum of King's College is the left testicle of a young gentleman who consulted me for a small swelling of the vas deferens, about an inch above the epididymis, and about the size of a small hazel nut. It was soft and painless, and felt like a small cyst. A month or two later the patient said he was better, as the swelling was smaller; the swelling, owing to the rupture of the sac, had become more diffused. I did not see the patient again, as he died a few months later of acute tubercular meningitis. The little cyst of condensed cellular tissue was connected by a narrow neck with the vas deferens, which was much thickened and contained caseous material. Its wall had given way where the neck of the cyst communicated with the interior of the tube, allowing the contents to escape. It is fair to ask whether the morbid material confined in the tube and cyst may not have given rise to the attack of acute tuberculosis to which the young patient fell a victim."

E. **Vesiculæ Seminales.**—The changes here are much the same as in the epididymis, the chief exception being that, as they are attached later, the disease has usually run its course before advanced suppuration and formation of fistulæ can take place. When trouble is taken to examine these organs during life it is usual to find one or both decidedly fuller and more prominent to the finger than in the normal state, this being partly due to inflammatory thickening of their cellular sheath. The existence of nodules is more decidedly pathognomic, but it is more rarely to be made out here than in the prostate. If the sheath be removed, the coils of the vesiculæ are found thickened and indurated. Later on, they become thinned, and the tubercular matter which they contain softens and suppurates; in some cases fistulæ form, opening at one time into similar cavities in the prostate, and at another communictaing with the bladder or rectum. Occasionally the suppuration converts these adjacent parts into one huge cloaca-like cavern.

F. **Prostate.**—This organ is usually affected together with the vesiculæ seminales, but in some cases of tubercular testis and epididymis the prostate alone is found diseased. Changes in the prostate can be more easily made out than in the vesiculæ. The organ feels swollen, firm and knotty. Less frequently, but more often than is the case in the vesiculæ, one or two nodules can be made out, which a little later are found to be softening, even to actual fluctuation. In June 1891 I saw a gentleman, aged forty-nine, the whole of whose right epididymis was uniformly and tensely distended with tubercular material, not in the nodular form, and not yet softening. The prostate was much enlarged, and craggy with massy deposits of the same nature, apparently of the size of hazel-nuts, and so hard as, together with their unevenness, to suggest prostatic calculi. There were cavities at the apex of each lung. At the end of the following November he again came under my observation. The deposits in the epididymis and prostate had all softened, and fluctuated to the finger. The patient died shortly after of phthisis.

When life is sufficiently prolonged, the abscesses in the prostate may open either into the deeper part of the urethra, or through the perinæum, or they may burrow about at the base and neck of the bladder.

Both the vesiculæ seminales and prostate may be affected unilaterally, the vesicula, or the half of the prostate affected, corresponding to that on which the parts below are most diseased. But it is more common for both vesiculæ and both lobes of the prostate to be involved. M. Réclus, alluding to the different opinions which have been held on this point, remarks that reliance on clinical examination alone would lead to the belief that it is more common for one lobe or one vesicula to be involved, but, as a rectal examination does not reveal slight and early lesions, it is easy to call parts healthy which are really diseased, and thus post-mortem examinations are alone to be relied upon.

As to the size of a tubercular prostate, there has been a good deal of dispute. According to Bérard and Delfau a prostate thus diseased is little, if at all, increased in size. While this may be true of a prostate which, containing but one small, nodular, caseous mass, impossible of recognition during life, may be truly tubercular, it is not so in cases where the disease is well marked and advanced. Here an increase in size is certainly the rule. Unfortunately the disease does not stop here in the genital organs. An ulcerative **cystitis** often co-exists in the later stages, and complicates the case by the intense pain in micturition, the vesical tenesmus and misery by which the close of the disease is often hastened.

The **kidneys** also, by an extension of the mischief upwards, become involved in a tubercular, suppurative pyelo-nephritis. Finally, as will be seen from some of the cases given below, other tubercular complications may arise, as in the lungs, bones, joints, membranes of the brain, &c. This question, how far tubercular disease of the testis tends to invade other organs, or how far it tends to remain localised, is alluded to later (p. 359).

Microscopical Appearances. The Starting-point of the Mischief in Tubercular Testis.

It has been much disputed whether the exact seat of the origin of the disease is in the intra-tubular connective tissue, in the tubes themselves, or in the blood-vessels or lymphatics. The fact that opportunities for examining the disease in its earliest stages are extremely rare, will account for this state of indecision, together with the uncertainty which, until recent years, has prevailed in the use of the term "tubercle."

I have no space here to detail the different views held by all the chief writers on the origin of tubercle in the epididymis and testis. Since the discovery of the bacillus, we have rather to settle how the bacilli reach the seminal gland, and how they spread after their arrival. Where tubercular mischief starts *de novo* in the testicle—*i.e.*, as the primary deposit in the genito-urinary organs—it probably arrives there by the spermatic artery. In cases where the testis is attacked secondarily to the prostate or bladder, the infection is propagated by way of the vas deferens to the epididymis.

When once, by either of the above routes, tubercle has reached the epididymis, it probably spreads by way of the lymphatics as well as by the tubes.

The following are the **chief microscopical lesions** met with in sections of a tubercular epididymis and testis:

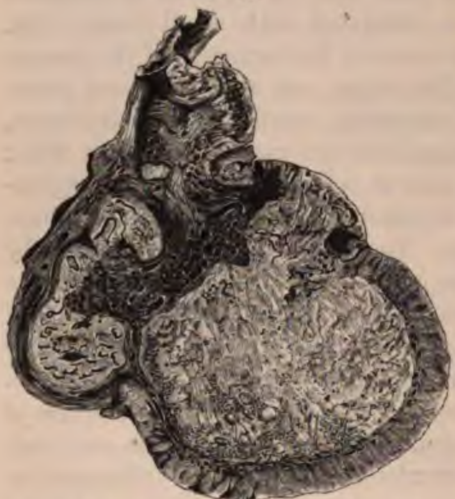
(1) Areas of small round cell-tissue resembling granulation-tissue in which, here and there, tubercle bacilli are found, and which are thus certainly tubercular. (2) Scattered about in this tubercular granulation-tissue are giant-cells with surrounding zones of small round cells. In some of the giant cells are bacilli. (3) Collections of pus cells. (4) Groups of seminal tubules with degenerating epithelium. In some the membrana propria is separating. These degenerating tubules show (*a*) walls infiltrated with small round cells, and (*β*) a lumen which contains one or more multi-nuclear, granular masses apparently formed by the desquamation and confluence of the endothelial cells. Mingled with these masses are pus cells and leucocytes. On transverse section of these degenerated tubules and these multinuclear masses an appearance closely resembling giant cells is seen. These have been named pseudo-granulations (Arnold). (5) Healthy seminal tubules. (6) Newly formed interstitial tissue of fusiform and branching cells with clusters of small round cells scattered throughout. This recalls the "fibroid" form of tuberculosis mentioned at pp. 337 and 351.

The Relation of the above Microscopical Changes to the Formation of the Characteristic Caseous Masses.—At certain circumscribed spots, whether in the parenchyma, the wall of a tubule, blood-vessel, or lymphatic, the connective tissue proliferates, and thus becomes infiltrated with small round cells.

which collect, tend to break down and become caseous. In the interior of the tubule, if we take this as an instance, the epithelial cells become swollen and fused together into irregular masses which are detached into the lumen of the tubules, and lying there recall, ere they too become fatty and caseous, "giant cells," from their size, irregular outline and many nuclei which represent the original epithelial cells. Not unfrequently, from the running together of several of the tubules, still larger masses may be formed. As these masses, lying within the tubules, meet and fuse with the caseating products which result from the cell-proliferation in the walls of the tubules, the characteristic yellow and white masses are produced. The vitality of the immediately surrounding tissues being much impaired, inflammation is set up around these masses, and thus the surrounding intertubular connective tissue, which is infiltrated with small round cells, becomes invaded, and takes a share in the formation of the caseous nodules. These, in the earlier stages, may show the usual zones, viz., one external, of richly nucleated, vascular, connective tissue, in which a few altered seminal tubules may still be met with; more internally, there is a zone of cells undergoing fatty degeneration, while the centre is occupied by a more or less amorphous mass of molecular detritus. The nodules increase in size by continuous caseation of the outer zone, then fuse to form the larger masses and finally break down into cavities, many-branched and containing ill-formed puriform fluid, caseous stuff, and filamentous shreds, imperfectly evacuated by the fistulous openings. Much more rarely the process is arrested short of the stages of abscess and fistula formation, and the masses become encysted, as in the lungs, by surrounding localised, interstitial inflammation. But, as is shown later (pp. 350, 359), there is strong evidence that this is not only rare, but, when it occurs, it is not to be looked upon as a proof that the mischief is now quiescent and harmless.

In examining the microscopic appearances of tubercle in the testis and its annexa, the following points should be remembered: (1) Tubercle is essentially destructive eventually. Possessing no vessels, at a certain stage it ceases to grow and undergoes retrogressive changes, fatty and caseous. (2) Giant, lymphoid and epithelioid cells are not specific, being by no means exclusively confined to tubercle, but common to many inflammatory conditions, and being found in all granulations. The only difference is that in the latter the multi-nuclear cells are sparingly present, while in tubercle they are abundant and well-marked. Thus, the pathognomonic features of tubercle do not lie in the form and arrangement of its cells, but in the presence of the bacilli, in however scanty numbers at the time of the examination, and in the life-history of the cells. (3) The formation of pseudo-giant cells inside the tubules has already been mentioned (p. 343). These are merely accidental consequences of the locality in which the tubercle is developed. (4) Dissemination of tubercle takes place by the vessels, lymphatic, and along mucous surfaces, by means of new foci arising from the old, and often at a considerable distance. The tubercular virus is transported, as in the case of the testis from the epididymis, along the surface of the mucous membrane, and, attacking spots where it is allowed to linger, penetrates the mucous surface. It there sets up specific inflammation manifested by development of nodules, which disintegrate and produce ulcerations. (5) The tubercle bacilli seems to require a definite predisposition in the tissues which it attacks. Instances of this in the form of gonorrhœa, injury, and "strumous" taint, have been already given at p. 329.

FIG. 53.



Acute tuberculosis of epididymis and testicle. The former shows caseating deposits, and greatly increased vascularity. The testicle, save at the periphery where some of the natural tissue still remains, is converted into a large deposit of tubercle. The amount of destruction and the vascularity are noteworthy. The specimen was presented by Mr. Treves, but there is no history. (Hunt. Mus.)

Acute Tubercular Disease of Epididymis and Testis.—I have hitherto been speaking of the common form of tubercular disease of the epididymis and testis, insidious in its origin and slow in its course. A different variety has been described by M. Duplay (*L'Un. Med.* 1860), sudden in its onset and rapid in its course, under the title of "la tuberculisation galopante du testicule." By other French writers—*e.g.*, M. Réclus—this variety has been described as "orchite tuberculeuse." This form, vhich begins like gonorrhœal epididymitis, with acute symptoms, s rare, and therefore, perhaps, has been overlooked.

Symptoms.—Suddenly, and usually without apparent cause, ain is felt in the scrotum, in some cases limited to the epi-idymis. This pain, in addition to being localised, may radiate o the iliac fossa and lumbar region. While usually there is no xciting cause, in some cases the mischief has followed an injury r a gonorrhœa. At the same time, or a few hours after, there s swelling of the scrotum, due in part to œdema of the scrotal unics, and to effusion into the tunica vaginalis. The scrotum ecomes smooth and hard, it may be, uniformly, or in a nodular orm. The testicle may be enlarged to two or three times its roper size, but does not, usually, contain appreciable nodules. ogether with the enlarged epididymis it may form a swelling s large as a turkey's egg, or, the two parts being still more nlarged and fused together so as to be indistinguishable, a mass he size of a fist. Up to this time, the majority of cases f acute tuberculosis simulate gonorrhœal epididymitis very losely, and as it is rare for patients to mention the possible revious existence of nodules in the epididymis the diagnosis ay be very difficult. But the progress now changes, and special haracters soon distinguish this form of acute epididymitis from thers. A period of calm succeeds the acute phenomena hich characterise the beginning, but the swelling goes on inreasing, the projection of the epididymis becomes more marked, nd often, in about three weeks, the presence of pus can be etected here. While this suppuration is one of the chief haracters of tubercle, and, as is well known, is very rare after onorrhœal epididymitis, this second stage of suppuration shows everal varieties in its course and termination according to the apidity of its formation and its extent.

M. Duplay seems disposed to look upon this acute form of ubercular mischief as only apparently acute. He believes that n the majority of cases there is mischief in the epididymis often n the form of small nodules, which have been overlooked owing o their latency. In some cases one finds similar masses in the pposite epididymis which show that its fellow had probably conained something of the same kind. A careful examination of he cord, prostate and vesiculæ seminales would often enable one o detect characteristic lesions, already perhaps of long standing. astly, it is not rare to find a urethral or sero-purulent discharge hich has come on either spontaneously or as a prolongation of one, probably gonorrhœa, and which is really a tubercular blennorrhagia. It is rarely thick and yellow. It shows extreme obstinacy to treatment. MM. Monod and Terrillon compare it to the catarrh which often precedes tuberculosis of the respiratory passages, or to the leucorrhœa which indicates the commencement of tuberculosis of the female genital organs. This discharge may be due to several causes—

(1) Simple over-secretion of the prostate, due to slow formation of grey tubercles here, in the central, not the rectal, portions, and explaining the possible absence of symptoms. The discharge here is clear and viscid, appearing in frequent drops at the meatus, without disturbance of micturition or hæmaturia. Occasionally the discharge is opaque and whitish.

(2) Cavities in the prostate containing pus and urine.

(3) Tubercular ulceration in the prostatic urethra (Dolbeau). This would probably be accompanied by some burning pain in micturition, vesical tenesmus, dysuria, and hæmaturia.

(4) To the lighting up afresh of an old gleety discharge due to gonorrhœa or stricture.

I have, four times, seen instances of the above discharge; in each case it was of the clear non-purulent variety. One patient was sent to me with clearly marked tubercular mischief in the prostate by Dr. Serjeant, of Camberwell, the organ was studded with nodules, not yet softening. The patient was nineteen, with marked tubercular history, and had suffered from slight hæmaturia and frequent micturition. The second was a case of early vesical rather than prostatic tuberculosis, but in each case the passage of a soft catheter through the deeper urethra was so exquisitely painful that I believe the prostatic urethra was involved. Bacilli were found in each case, in one by microscopical examination, in the other by injection into the anterior chamber of a rabbit. The third patient was a young medical man also with early prostatic, and perhaps vesical, tuberculosis. The discharge in each case presented itself as a clear watery moisture, constantly present at the meatus, and occasionally, as when the urethra was squeezed, amounting to a drop at a time. In the fourth case, the discharge was, perhaps, connected with a focus in the prostate, though I have never been able to detect one. The discharge ceased (and has not returned for three and a half years) after removal of the kidney. The patient was sent me by Dr. Phillips, of Bedford, with many of the symptoms of renal calculus. I explored the right kidney September 1888, but found no stone.

The symptoms continuing, the kidney was removed in the following December. For six weeks before this operation, in addition to the hæmaturia, pyuria, and frequent, somewhat painful micturition, there was a sero-purulent discharge from the meatus. This ceased about three months after the nephrectomy. The patient finished his term at Cambridge and took a curacy. In 1890 he married and has had two children. One of the children died soon after birth. A deposit in each vesicula seminalis which appeared at the end of 1889, was found by me, October 1892, to have very slowly increased, but at the latter date to show no sign of softening. I am unable to explain the discharge, unless it was tubercular, but in this case it was not examined for bacilli. I believe it to have been due to early tubercle in the prostate, which, unlike those in the vesiculæ seminales, was not to be detected, and which also had not softened. The patient, in October 1892, was free from all urinary troubles, holding his water for six hours in the day and not being disturbed at night.

Diagnosis.—The chief points in the diagnosis of acute tuberculosis of the testicle are: (1) The existence of this discharge, which should always be examined for bacilli. (2) Local evidence to be obtained from the prostate, vesiculæ seminales, cord, or opposite epididymis. (3) The general aspect of the patient, "scrofulous" or phthisical. (4) This last is one of the most valuable, especially in those rare cases where rapid tubercular enlargement attains to a great size—*i.e.*, that of a turkey's egg or fist—and where in the absence of any helpful history, the case simulates malignant disease. It consists in waiting till a short time longer clears up the case, as it generally does, by suppuration taking place in the swelling.

The following case (Rockwell, *New York Med. Journ.*, Jan. 10, 1885) bears on the above. The age of the patient and the satisfactory state of the general health are noteworthy. The patient, aged sixty, noticed while lifting a heavy package a sudden pain in the left testicle. This enlarged quickly, and in two weeks was as large as a small hen's egg, and tender. The general health was excellent, and there was no tubercular or syphilitic taint. Six weeks after the strain he came under Dr. Rockwell's care. An exploratory incision showed that the epididymis consisted of a sac containing cheesy and flocculent pus. On account of the patient's age, and the certainty of a prolonged stay in the hospital producing deterioration of his health, castration was performed. The wound healed quickly and the patient was discharged in three weeks.

I have only met with one case of acute tuberculosis of the testicle and epididymis. The patient, aged fifty-five, was sent to me by Dr. Carroll, of Dulwich, in October 1890. He was a carpet-layer by trade and knew of no cause for the outbreak, save the possibility of the scrotum and its contents being bruised while he was at his work. This, however, seemed very doubtful. On each side the epididymis and testicle were much enlarged and blended together, forming on each side a mass of the size of a hen's egg, smooth and tense, and giving the feel of firmly set suet, or putty. There was no tubercular or other taint of any kind, and no evidence of stricture. No tubercle could be found elsewhere. The swelling had begun suddenly, but without redness or pain, three weeks before. The case resisted strapping, biniodide of mercury and cod-liver oil, during the fortnight that the patient attended. During this time his temperature was 99°, and he was losing flesh. I advised the man to come into the hospital for the case to be cleared up, but at this time he obtained work in another part of England, and I lost sight of him.

Symptoms.—(A) **Of the Usual and More Chronic Form.** (B) **Of the Acute.**—These latter have already been sufficiently given at p. 345. (A) **Symptoms of the Chronic Form.**—While it is convenient to speak of the above two groups it must be remembered that intermediate ones fill up the gap between the two, some being acute throughout, others being acute first and chronic later, and others slow from first to last.* As it is to the type of these that the majority of cases conform, it is the symptoms which they present which will be especially alluded to here. The symptoms may be given according to the three stages through which the disease runs its course. (1) *In the first stage* one or more small painless nodules or small bosses are found to have formed insidiously in **the epididymis.** Probably there is an earlier stage in which isolated tubercles are developed, and later on coalesce to form the above nodules. The head of the epididymis is the part which is usually first attacked, perhaps, as I have suggested, from the fact that here the spermatic artery divides into its two primary branches for the epididymis and testicle; but not unfrequently the first nodule is met with in the tail (p. 333). In severe cases one or more are noticed in the body, and the whole organ is soon affected. If the epididymis be involved in part, the nodules are at first of considerable hardness, and clearly defined. Their appearance is absolutely insidious and free from pain, or any evidence of inflammation. The patient's attention is drawn to them by accident, as in washing the part. When the whole of the epididymis is involved its volume is much increased, exceeding that of the testicle (Figs. 46, 52). It now resembles a semi-cylindrical tube which surrounds two-thirds of the circumference of the testicle, uniformly distended, or rosary-like with its nodules. Even when the distension is uniform, the head and tail usually show larger projections than the rest of the epididymis. During this stage the testicle itself usually remains normal in size and elastic to the feel, though, even now, careful examination may succeed in detecting small rounded bodies of the size of small shot in the vicinity of the body of Highmore. In rarer cases, both epididymis and testicle are attacked and enlarge simultaneously, forming a swelling as large as a turkey's egg, or even as large as a small fist, it being now difficult, if not impossible, to isolate one organ from the other.

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* In some cases the disease after progressing very slowly for many years suddenly lights up into activity, and rapidly invades the cord. At the same time some enlargement may be noticed in the opposite epididymis. (See a specimen, No. 2774, St. Bartholomew's Hospital Museum.)

The presence of **a hydrocele** should be inquired into. We have seen that this may be expected in about one-third of the cases. The different varieties and the alterations in the tunica vaginalis have been given at p. 337. These will vary at different times; thus, an attack of inflammation may convert the fluid which, up to this time has resembled closely, as far as naked-eye characters go, that of ordinary hydrocele, into a sero-purulent collection, or may lead to its absorption, the cavity of the tunica vaginalis being left more or less obliterated. MM. Monod and Terrillon (*loc. supra cit.* p. 402) think that early changes may be thus detected. As long as the parietal layer is smooth and healthy, the testicle, when lightly manipulated between the thumb and index-finger, slips readily away, but as soon as the tunica vaginalis is affected this free gliding of the parietal upon the visceral layer no longer takes place.

(2) *In the second stage* caseation, softening, and suppuration follow. It is rare for these to set in acutely, as a rule the evolution is here also slow, painless, and insidious. Over one of the nodules the scrotal skin is noticed to be becoming adherent; it then becomes dusky-red or violet-purple, and, a little later, fluctu-

ation is detected here. The period at which this stage of softening sets in is most variable. While in the acute variety (p. 345), it is usually reached by the third or fifth week, in the chronic or common form the nodules may still be hard after a duration of six, nine, or twelve months. M. Réclus has noticed this condition to persist as late as the second or even the third year. The onset of the second stage will certainly be hastened by a careless way of living, and such occupation as riding, &c., and, of course, by an unfavourable general condition of the patient.

(3) *Third Stage.*—When the abscess opens spontaneously, the pus first discharged is purulent or sero-purulent with grumous flakes; later on it becomes thinner and more watery. The stage of fistulæ now results. The number, site, and condition of these varies. In the majority of the cases they are found at the lower and back part of the testicle. Even when situated above and in front, Réclus points out that they do not necessarily communicate with the testicle, as this organ may be in the condition of inversion. In some cases the orifice is minute and hidden by the corrugations of the scrotal skin, only to be detected after a careful search by the moisture with which it weeps; at others it is large and ulcerated, and bordered by undermined, dusky-red skin. In other cases it shows a mass of prominent granulations which sprout from the tunica albuginea or the testis itself, according to the variety of hernia or "fungus" which is now present (p. 376). When once formed, these fistulous openings and the cord-like sinuses leading into the caverns which are now the remains of the caseating nodules (p. 343) usually persist. In a few cases, when all the caseous material has been got rid of, they are obliterated by the formation of granulation and scar tissue, and all that remains is a depressed cicatrix. Much more commonly all the caseous stuff is not extruded by nature's efforts, and if the fistula cicatrises it is liable under fresh attacks of inflammation, pain, and swelling to reopen and discharge from time to time. I have given an instance of this at p. 359. Even when the opening has healed soundly and for a long time, the patient must not be looked upon as safe, as I, by the above and other cases, shall try to impress upon my readers. Another most instructive instance of this is given by M. Réclus (*Du Tubercule du Testicule*, p. 101). A patient aged fifty-two, under the care of M. Verneuil, gave the following history:—"He had always been strong, had been free from cough and had never spat blood. His personal and family history were good. Seventeen

ears before he had had a painless swelling of one epididymis, hich had suppurated and been opened. Healing had taken lace quickly, but some months after a fresh abscess formed, and ersisted for about a year and a half, when it healed. The atient had had for a long time suppuration about his rectum, ut nothing wrong with his sexual gland. The above suppuration ventually proved fatal, and an autopsy proved the existence of icatrised foci in the epididymis, and of numerous "fibrous granuations" in the testicle. In addition to the unusually long time his fistula remained healed, the suppuration about the rectum is oteworthy. It is not stated whether this, as is probable, dated o tubercular mischief in the prostate. Again, though during the ater years of the patient's life nothing wrong was found in his exual gland, it is clear that all this time the testicle contained otential, though entirely latent, sources of future mischief."

Another case of a similar kind in which this fibroid form of uberculosis was present, and in which the symptoms of tubercular ischief extended over many years, eventually invading the rethra and leading to extravasation of urine, was brought by . Doyen before the Société Anatomique of Paris (*Le Progrès éd.*, t. xi. 1883, p. 493). The patient was aged fifty-four, and nder the care of Dr. Lucas-Championnière. For twenty-two ears he had had chronic bronchitis with occasional hæmoptysis. oth sexual glands were the seat of tubercular mischief. The ight epididymis had been enlarged for twenty-seven years, and efore the appearance of any lung trouble. The patient had een married for six years, but had no children. Extravasation f urine took place from tubercular ulceration of the urethra, and as followed by acute and fatal miliary peritonitis. At the postortem examination, the *right* testis was atrophied, and showed ubercle undergoing fibrous change. The enlargement here was ue to a pus-containing cyst, which represented the epididymis. n the *left* side the testis was also atrophied, but did not contain ubercle. The epididymis was here also a pus-containing cyst. he following points are noteworthy: (1) The unusual duration of he case. (2) The long existence of pus-containing cysts, without ny tendency to cause ulceration of the skin. (3) The fibroid orm of the tubercle met with in one testicle.

In addition to the symptoms which have been described as et with in the epididymis and testicle, much may be gained by areful examination of the vas deferens, prostate, and vesiculæ eminales. The morbid conditions met with in these have been fully enumerated at pp. 339, 340. It remains to mention the clinical evidence which in the case of the prostate and vesiculæ seminales can be obtained by a rectal examination, and which corresponds to the lesions given at p. 340. It is not always easy, especially in the earlier stages of tubercular deposits, to be certain as to the exact condition of the parts now under examination. And it is necessary, before pronouncing that a prostate is diseased, to be well acquainted with a healthy one. On these points M. Réclus makes the following judicious remarks: "We should call a prostate healthy when it almost blends with the tissues which surround it; when one has difficulty in defining it, when it is elastic and yields to the exploring finger. On the contrary, a prostate is diseased when the finger feels it clearly, and can define its outlines, and, owing to its resistance, isolate it from the surrounding structures." With regard to the condition of the tubercular prostate, and the information to be gained by a rectal examination, M. Réclus thinks that it is rare for it to appear healthy.* As a rule, lesions are found early. Thus the gland is more voluminous, this increase in size affecting the entire gland, or only one lobe, and most frequently that which corresponds to the testicle which is most affected. M. Réclus considers that this increase in size, though denied by some writers, is very frequent. In a few cases, a prostate which has atrophied, after evacuation of its caseous foci, is smaller than normal. Tuberculosis of the vesiculæ seminales is less easy to make certain of than the affection of the prostate. But an unusual distinctness of one of the bodies, or, in other words, an unwonted facility in detecting them, when no inflammatory condition is present, will always lead to a suspicion of tubercle. When both are enlarged, their V-like convergence toward the prostate is very marked. A nodular, bossy condition is even more pathognomonic and an unusual degree of resistance and tenderness will also b points that may help.

Before leaving the list of symptoms which characterise tuberculosis of the seminal gland, allusion must be made to thos afforded by the general health of these patients. In a surgica work like this there is no need to go into these in detail.

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* Vidal de Cassis believed that tuberculosis of the prostate started frequentl from its urethral aspect, and that while this might be deeply affected by softenin of tubercular deposits, the rectal aspect would show no lesions detectable by th finger. In these cases tuberculosis of the prostate may only show itself after time, by evidence pointing to inflammation of the neck of the bladder.

would only remark that while in some cases the surgeon will at once find his suspicions confirmed by the aspect of the patient, or by traces which he carries of the tubercular diathesis, in other cases he will be puzzled by the entire absence of these. In other words, two groups of patients may be met with here. In the one, the constitution, the family and personal history will all support the diagnosis of tubercle; in the other, this evidence may be entirely wanting, and the patient may present the appearance of vigorous health combined with really fine physique. Three such cases have come before me, all from the country. In two patients of twenty-four and twenty-nine, the disease was bilateral, and affected both testis and epididymis; in one, all treatment was refused, in the other double castration was performed. In the third, the patient aged eighteen, was a member of the football team of one of the Midland counties. Here, one small, softening nodule was present in the head of the right epididymis. Sound healing took place after the use of a sharp spoon, but, as is often a disappointing result with hospital patients, I have not been able to trace these patients' after-history.

Diagnosis.—I. In the *ordinary or chronic form* of tubercular disease this is rarely a matter of any difficulty if attention be duly paid to the following points: the tendency of the disease to start in the epididymis, to localise itself, and to be especially marked there; the usual feature of the presence of small nodules and bosses; the gradual setting in of caseation, softening and suppuration, the characteristic way in which the skin is involved, and the formation of fistulæ. In addition to the above the methodical examination of the vesiculæ seminales and prostate, and of the general health and history of the patient will be of service. Finally, when the case is obscure, light may be thrown upon it by microscopic examination of the sero-purulent discharge from the fistulæ, of the caseous material obtained by erasion, or of the fluid of a co-existent hydrocele, and, when the microscope fails, by resorting to inoculation.*

The following are the **diseases in which some difficulty may arise in the diagnosis:—(*a*) Induration of the epididymis**

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* Damsch recommended this step as a means of diagnosis in diseases of the genito-urinary apparatus in 1882 (*Deut. Arch. f. Klin. Med.*, Bd. xxxi. Hft. 75, 85). On this subject I may also refer my readers to a paper by Dr. Washbourn and myself in the *Guy's Hospital Reports* for 1890: "Two Doubtful Cases of Tuberculosis, in which the Diagnosis was cleared up by Inoculation." Both of these were bladder cases.

dating to some acute or sub-acute urethritis. Here the induration is in the tail, and what is of more importance (p. 333) it is usually somewhat elongated or fusiform, not nodular or bossy, and it has no tendency to break down and involve the scrotal skin. The history of the patient, the previous existence of a gonorrhœa, gleet, or other cause of urethritis, the absence of any evidence of tubercular mischief in the prostate or vesiculæ seminales, and the examination of the urethra with a soft bougie which may detect some narrowing, will all help in clearing up the case.

The following case is a good instance of how tuberculosis of the sexual gland may be simulated by a chronic inflammatory condition. It is reported by Dr. Bangs (*New York Med. Journ.*, Oct. 1886, p. 426). The patient, aged nineteen, stated that between four and five years before he strained himself, and felt sharp pain in the right testicle which at once began to swell. He was confined to his bed for several days. The swelling slowly disappeared in four months. He remained well up to about three months before he came under Dr. Bangs' care; at this time he was struck on the scrotum and both sides swelled up. This continued and, about a month before, a small "pimple" opened spontaneously on the left side and continued to discharge. A day or two after his coming under observation he had sharp stinging pain in the glans penis. On examination a double hydrocele was present. The right testicle was normal. The left was double its proper size and tender. The epididymis was indurated, irregular and somewhat knotty, and the testicle gave the impression of an irregularly indurated organ, with intervening soft spots. The left cord was enlarged and indurated. At the lower portion of the left side of the scrotum was a sinus discharging thin pus. Per rectum, the prostate was sensitive, and the left lobe somewhat thickened. In spite of treatment including absolute rest, the case followed a very chronic and relapsing course. Another surgeon diagnosed tubercle, and advised castration. Against this view Dr. Bangs urged: (1) That the cord was definitely enlarged too early in the case, and moreover, the enlargement was not nodular; (2) the frequent exacerbations and acuteness of the pain; (3) the evidence obtained by a rectal examination pointed only to ordinary inflammation of the prostate, there being no nodules here or in the vesiculæ seminales. A few days later, the patient passed a mulberry calculus. The sinus afterwards closed and the testicle became, in two months, almost normal in size.

(β) **Syphilitic Epididymitis.**—The small induration occasionally but rarely met with in the epididymis in the course of secondary syphilis, and described at p. 311, will be quickly distinguished from tubercular deposits in the same place by the result of treatment.

(γ) When the epididymis and testicle alike are both involved, and form a single voluminous mass, the suspicion of **a malignant growth** or **of syphilitic diffuse orchitis** may arise. This, however, will rarely happen, for by the time the testicle is much involved, evidence of suppuration, if not actual fistulæ, will usually be present in the epididymis. In the case of **sarcoma*** the prominence of bosses will, if present, be marked rather in the testicle than in the epididymis; pain or dragging weight will be more marked features; examination per rectum will give no evidence of tubercular deposits; the mischief will be limited to the contents of one half of the scrotum, while tubercular disease may attack both sides; and finally, the steady progress of the sarcoma will be decisive. It must always be remembered that tubercular disease of the seminal gland may attain to a large size before suppuration takes place. No. 2778B St. Barth. Hosp. Mus. is a good instance of this. The gland here is about the size of a hen's egg. It was granular, unduly firm, and unusually adherent to the tunica albuginea, which is thickened. The tunica vaginalis is partially adherent. The epididymis is also enlarged with caseous material which is breaking down in places. The cord is greatly thickened, the vas deferens especially so. No. 2777 in the same collection shows another very large tubercular testis removed from a patient at forty, It is uniformly full of tubercle, no natural structure being left. The epididymis on the opposite side was also much increased in size.

St. Bartholomew's Hospital Museum contains another specimen (No. 2776) of acute tubercular disease in which the aspect is strikingly solid, and like a new growth. The testis is uniformly enlarged and its posterior part is occupied by yellowish caseous material; anteriorly it is studded with yellowish spots of the same. The epididymis is also enlarged and contains caseating tubercle. The patient, aged twenty-one, had noticed, six weeks before admission, that his testicle was enlarging and painful. The enlargement was uniformly firm and elastic. Before operation the disease was thought to be malignant. The real nature was verified microscopically.

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* Mr. Walsham (*loc. infra cit.*) also records a case of a patient, aged fifty-two, in whom, eight weeks after a blow, the left testicle had reached the size of a duck's egg, and closely simulated sarcoma, being uniformly enlarged, smooth, tense and firm. In this case the rapid enlargement had taken place without any of the inflammatory symptoms usually present in acute tuberculosis of the testicle (p. 344).

The diffuse orchitis of syphilis will usually be readily distinguished by the history, or other evidence of syphilis, the characters given at p. 315, and by the result of treatment. Mr. Walsham has recorded (*Brit. Med. Journ.*, vol. i. 1884, p. 855) a very rare case, but one of great interest, from the closeness with which it simulated the testis of tertiary syphilis. The patient was thirty-three, an enlargement of the right testis had been noticed for eighteen months. It was about the size and shape of a jargonelle pear; irregular, uneven, and nodular, firm, resisting, non-elastic, and of the same consistency throughout. The skin was not affected, the prostate and vesiculæ were apparently healthy. After castration the body of the testicle was found to be infiltrated with tubercle, caseating in places.

II. In the *acute form of tubercular disease* of the epididymis and testis, described at p. 344, greater difficulty may arise. As by reference to p. 344 it will be seen that this form may set in rapidly with the acute symptoms of redness, heat, pain, and even of a urethral (tubercular) discharge, it may readily be mistaken for an epididymo-orchitis of urethral or traumatic origin. **The chief points to rely upon in the diagnosis** are: (1) The result of an examination per rectum, which may show evidence of latent deposits in the prostate (p. 340) and vesiculæ seminales, these having started the mischief lower down in the epididymis and testicle; (2) the existence perhaps of a small and unnoticed deposit in the opposite epididymis; (3) the patient's family and personal history. The above will probably be sufficient in most cases, especially where the patient is of what used to be called "the scrofulous type." But where acute tubercular mischief sets in in the epididymis and testicle of a patient apparently robust and vigorous, it will be necessary to resort to (4) patience and waiting. After a short time, three to four weeks, the acute symptoms subside but resolution does not take place; the parts which have remained enlarged and hard will now probably show nodules or small bosses, more or less well defined, which later, and probably after no long delay, soften and discharge.

Course and Prognosis.—It is quite impossible, and would only be misleading, to lay down any hard-and-fast-lines. It must be sufficient to draw attention to some general points which are of great importance. These are: (i) **Two classes may be made, according as the tubercular mischief runs its course slowly or rapidly**, a difference which, perhaps, depends upon the amount of bacilli which first find their way to the epididymis and testicle, and the degree to which these parts by previous injury, congestion, &c., form a nidus or soil in which the bacilli can luxuriate or find a *locus minoris resistentiæ*. Thus, the extent to which the mischief remains localised to the epididymis, the duration of the first stage, that of unsoftened nodules, and the number of these, will all be points to watch. When the second stage has set in, the rapidity with which caseation and suppuration occur,[*] the number of fistulæ, and the persistence with which these discharge, will also show to which class the case belongs. (ii) **The extent to which the testicle itself is attacked** is a point of great importance. The diagnosis here is a matter sometimes of much difficulty. But by careful examination, long before nodules or deposits become visible in the parenchyma of the gland, small shotty irregularities may be detected by careful examination in the body of Highmore and the testis. Sometimes before this is possible by palpation, occasional attacks of swelling and tenderness draw attention to the existence of these lesions in the testicle itself. Though mischief in the epididymis by its closer contiguity, through the vas deferens, to the vesiculæ seminales and prostate, seems more likely to lead to secondary deposits in these organs, tuberculosis of the testicle itself leads more certainly to complete suppurative destruction of the male sexual gland, and it must always be remembered that by the time the testicle is attacked, the disease has usually gained a firm footing in the epididymis.[†] (iii) **The liability of the disease to become bilateral.**—The same variability as to the course the disease will take awaits us here. In the acute form of tuberculosis of the epididymis and testicle, both sides may be attacked with the same acuteness. In other cases, while the mischief falls with sudden and rapid inflammatory onset on one side, a small, latent, insidious and undetected nodule may be detected in the opposite epididymis. But in the more usual and chronic form it is commoner for one side only to be found diseased. The frequency, however, with which one side seems to escape is, in reality, fallacious. It is true that out of seventy-nine cases collected by M. Réclus the tuberculosis was unilateral in fifty-eight cases, and bilateral in twenty-one cases. But it is not stated in how many of these cases the condition was verified by a post-mortem examination. The difficulty with which patients are followed up must always be remembered, and a testicle which may be perfectly healthy when examined at one date may, later on, be found to have become the seat of similar mischief. It is only too common for the opposite testicle to be affected a few years after its fellow. How far the removal of one source of suppuration with all the weakening it leads to, the spoiling of daily life, and evil effects upon mind and body, may put the patient in a better condition to get rid of his disease, we cannot say. We must wait for a larger number of cases treated actively at the earliest date possible, before we can pronounce definitely on this point. All we can say at present is that the above treatment is based on the lines of common sense, and that there are a sufficient number of cases recorded in which its adoption has seemed to defer the onset of the disease in the opposite side for several years—four, five, or more, and thus to encourage us to make further trial of early and thorough erasion, and, this failing, of castration. (iv) Whether **the disease** runs a rapid or chronic course, whether it seem to localise itself in the epididymis or attack the testicle, whether one or both sides be involved, it **is to be looked upon as, if left to itself, an ultimately fatal disorder.** I have expressed my opinion decisively on this most important matter. I have tried to show that there is too great a tendency to trust to medical means here; that one of two opinions is much too often given with regard to these cases; one, that there is good hope that the mischief, if left to itself, will undergo a process of natural cure by atrophy, and more or less suppurative destruction of the parts involved; the other, that nothing can be done, for whatever course is taken there is no possibility of eradicating the disease. With regard to the first of these opinions I have tried to show its danger, and to inculcate that at the present day, with our knowledge of the course which tubercle, if left to itself, runs here as elsewhere, and with the means now at our command, there should be no dallying with such a belief for a moment. With regard to the second opinion that the disease is necessarily a fatal one, and admits of no active treatment, I hope I have put the case fairly. I would in no way make light of the fact that tuberculosis of the epididymis and testicle is too often merely the local expression of a general outbreak in the genito-urinary organs. But I maintain that in a large number of cases this outbreak does not take place all at once; that it starts in the epididymis, and only reaches the other parts, later, because it is too often allowed to do so. If all the male sexual organs, epididymis, testicle, vesiculæ seminales, and prostate, were supplied by arterial offsets given off at the same points, the bacilli would reach them all at the same time, and the outbreak of the mischief would be not only general but simultaneous. But that this is notoriously not the case anatomical data teach us, and in many cases anatomy is here supported by clinical results. Until we despair of these cases we should at least put ourselves in a position to show that we have done our best to eradicate at the earliest possible moment the primary lesion while it is localised and readily attacked.

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[*] In some cases after a prolonged first stage of quiescence, the second stage, of softening, sets in rapidly and acutely without apparent cause. After pointing and discharging of the abscess, another period of quiescence may follow.

[†] I cannot therefore accept the dictum of M. Salleron (*Arch. Gén. de Méd.*, 1869, t. xiv. p. 176), that tubercular orchitis "terminates nearly always in loss of the seminal gland *without compromising gravely the general condition of the patient. Tubercular epididymitis, on the contrary, compromises much more certainly the general condition, the complete ruin of which it may bring about.*" (The italics are my own.)

With regard to the other cases in which the tuberculosis of the epididymis and testicle is clearly secondary, or certainly co-exists with lesions in the prostate and vesiculæ seminales, we are not, of necessity, to hold our hands. Where the mischief here is of early date, where it is running a slow course, we may still hope to benefit the patient by a timely castration, which by removing a useless and damaged organ will improve his general condition, and defer the evil day which very likely must come.

I have said before (p. 343) that the occasional encapsuling and partial cretification of caseous deposits in the epididymis must not be looked upon as a sign that the disease is now quiescent, at an end, or no longer a cause for anxiety.

It is such cases as the following, the history of which is a very common one, which have led me to express the opinion (p. 358) that while tubercular disease here may appear to heal and reach a harmless stage, it really remains infective, and must be looked upon as, if left to itself, ultimately fatal.

The following is of a similar character. In June 1892 Dr. E. C. Greenwood, of St. John's Wood, asked me to see a patient, aged forty, with scrotal and perinæal suppuration. The man, a publican, whose mother, sister, and wife had died of phthisis, had had tubercular disease first of the right and, a year later, of the left epididymis, which in each case had ended in suppuration and fistulæ, two openings forming on the right side and one on the left. For seven years those on the right side had been closed, and for six that on the left. The patient became a widower, and, two months before I saw him, had contracted a gonorrhœa. Epididymitis followed with suppuration and opening up of the three old sinuses, the pus burrowing backwards in the perinæum with sub-acute cellulitis. When I incised this and scraped out the old sinuses, besides the ordinary pus and granulative tissue, small cretaceous foci came away with the sharp spoon. From the patient's account these has been quiescent for certainly five years in the one epididymis, and six years in the other. The vas deferentia in this case had not been enlarged, which probably accounted for the fact that the tubercular mischief had not, apparently, reached the prostate and vesiculæ seminalis. But since the exacerbation of the old mischief by the fresh venereal epididymitis, the right cord has become distinctly thicker than its fellow.

The following cases are even more striking, as showing extension of general mischief from deposits in the epididymis, the long time in which these may be apparently innocuous, and the very grave results which they may bring about later. The first three are reported by Mr. Barling. (*Birm. Med. Rev.*, March 1892, p. 152.)

A patient, aged twenty-two, had hard, nodular thickening in each epididymis, and suppuration following with sinuses, but little discomfort resulting. He went to Australia, and lived there seven years, at the end of which time micturition became painful and frequent. A year later, it was evident that the vesiculæ seminales, prostate and bladder were all involved, and the pus in the urine showed tubercle bacilli.

In the second case, the patient, a medical man aged twenty-eight, discovered a hard irregular mass in the lower part of one epididymis. This eventually suppurated, but the sinus dried up in a few months, and no inconvenience was felt from the testis, a hard nodule only remaining. Five years later he complained of occasional painful and frequent micturition with hæmaturia. The symptoms became more and more troublesome, but the patient still went about his work, for three years, when he died of tubercular meningitis.

In the third case, the patient, aged twenty-nine, had, when twenty-three, been kicked in the scrotum by a colt. When the acute symptoms subsided an enlargement of the left epididymis resulted, and this enlargement suppurated. The suppuration ceased, leaving a hard, nodular patch which gave no trouble. Two years later, the left vesicula seminalis was found to be enlarged, hard and irregular, but the bladder then and since remained healthy. In 1892, the patient was suffering from tubercular osteitis of the dorsal vertebræ, with angular curvature and abscess.

The following case is given by Prof. Senn, in his *Principles of Surgery*, p. 541. The patient, aged thirty-five, had been married ten years, but was childless. When twenty-six years of age he noticed small, hard swellings in each epididymitis. When he was thirty-three he had cystitis not relieved by treatment. When he was thirty-five the left knee-joint became swollen and painful. At this time his temperature was from 100°–103°. Pyelo-nephrosis with perinephritic suppuration followed, and were relieved by nephrotomy.

(1) **The Frequency with which other Tubercular Lesions are likely to Arise and Complicate Tuberculosis of the Epididymis and Testicle.**—These are very weighty points which must never be lost sight of when trying to foretel the future of a patient. With regard to pulmonary lesions it has been shown by M. Réclus that these are not as frequent a complication as was formerly thought to be the case, though it is probable that this is due to the patient's life being too often closed by deposits in other parts of the genito-urinary organs. Of these I have already spoken more than once, and, while not underrating their frequency, have tried to show that this is largely due to the way in which the surgeon too often holds his hands. The possibility of the occurrence of other tubercular lesions must always be remembered in these patients—viz., disease of the spine and other bones, pulpy joints, fistula in ano, pyelitis, pleurisy, peritonitis, meningitis.

Mr. Bennett has recorded (*Med. Chir. Trans.*, vol. xxi. p. 139) five cases in which tubercular disease of the testicle and epididymis was followed by caries of the dorso-lumbar spine. Three of the patients were lost sight of after very short attendance. The fourth refused castration, and was treated by plaster-of-Paris and poro-plastic supports, chiefly as an out-patient. An iliac abscess formed and death took place from general tuberculosis in about two years from the commencement of the disease. The fifth patient also refused castration and only consented to this step, when a trial of absolute rest in St. George's Hospital had led to an increase in the original disease and deterioration of the general health. The operation was followed by rapid improvement, and a year later "not a sign of disease could be detected in any part of his body." It is noteworthy that in all these cases the spinal disease was most insidious, that it followed the breaking down of the tubercular lesion in the epididymis and testicle, and that it appeared before any invasion of the vasa deferentia or vesiculæ seminales, &c. In the year 1881, I recorded (*Syst. of Surg.*, vol. iii. p. 533) a somewhat similar case in which the spine was invaded before the rest of genito-urinary system.

A man, aged thirty-three, had been under my observation for two years with the following condition of things:—When he came, he had typical disease of the right globus minor in the first stage, and insidious. A much larger deposit existed on the left side, which was already commencing to suppurate. Pneumonic phthisis on the right side followed, and caries of the mid-dorsal region, with the usual girdle pain and angular curvature. On account of the spinal trouble the patient rested for a few weeks, during which time the disease of the left epididymis broke down still further and discharged. After this period the patient passe his time for quite a year and nine months in different parts of th country, and at the seaside. The disease in the right epididymi remained quiescent, in the left a sinus discharged for some tim and then closed. The mischief in the lung did not appear t advance, his back, though deformed, became free from pain, an the patient, when last seen, was following a light employment It is to be noted that here there had been no enlargement of th vas deferens up to the time when the patient, as too often happen with hospital cases, was lost sight of.

(2) **A few points connected with the position and functions of the epididymis and testicle** bear upon the course of it tuberculosis and deserve mention. I have already spoken of thei distinct arterial supply (pp. 323, 359). Again, their isolated, detached, and, as it were, floating position point out that here, if anywhere, the results of erasion if early and thoroughly performed, an later on, if not too long deferred, castration, will give us good result The intimate connection of these organs with the deeper parts of t genito-urinary organs needs no further remark. Finally, the testic is, from its function, an organ in which the history given by o patients may be misleading. There is no reason to believe th

during the earlier stages of tuberculosis sexual feelings are in abeyance. Tuberculosis occurs here most frequently during the years of the greatest sexual activity, and a thoughtful practitioner must never lose sight of the fact that this organ is not one as to the employment of which we easily get complete or truthful statements, while its function is one of the persistence of which some owners are anxious to obtain practical proof long after a time when sexual feelings would have seemed likely to have ceased.

Treatment.—This must be divided into—(*a*) **Medical** or **Palliative** and (*b*) **Operative.**—I would say at once that I have very little faith in medical treatment here. I am strongly of opinion that the expectation of tubercular mischief becoming encapsuled in the epididymis or testicle has been greatly exaggerated, and that if the hope of this is held out to the patient it will end in disappointment and in the loss of precious time. I admit that tubercle here may often appear to become quiescent and apparently remain so for some years, the patient getting about, leading an ordinary life, and appearing quite healthy during this time, and I have supported this opinion with cases, p. 359. But I maintain that, as a rule, this period of calm and well-doing is only apparent and fallacious, and that sooner or later the disease shows evidence of progressing, nodules in the epididymis soften, the testicle itself becomes involved, or, what is infinitely worse, the disease is found to have extended to parts out of reach—viz., the prostate or vesiculæ seminales. And it cannot be too emphatically pointed out that these parts may become invaded while the disease in the epididymis and testicle is very slight, while it is quite quiescent, and that the invasion may have taken place without giving any external sign; thus, the vas deferens may feel quite healthy, and there may be no urinary symptoms to call attention to the prostate, bladder, kidneys, &c. Finally I may point out that when the tubercular mischief has spread to these parts, it is not only irreparable and beyond reach, but it destroys life in a particularly miserable, and, in the case of the bladder, an agonising way.

(*a*) **Medical or Palliative Treatment.**—This includes every step that can be taken to improve the general health in order to enable the patient to get rid of his bacilli and to promote the absorption of any tubercular nodules which have not yet suppurated, and the healing of any discharging fistulæ. To secure these ends, sea-side air, especially that of Ramsgate, a sea-voyage to a warmer climate, or, failing these, as bracing an air as possible, with plenty of sunshine, and avoidance of all chills and damp are of primary importance, attention being also paid to the ventilation and outlook of the rooms occupied by the patient. For poorer persons some such change in their surroundings is of paramount importance, but while convalescent homes, especially those at the seaside, may be of help in improving the general and local condition, I would insist that a stay in a hospital, save for operative treatment, is usually most pernicious. I have never known a case of tubercular mischief in these organs benefited by this, but have known many made worse, a fact to which some of the cases quoted in this chapter testify. Almost equally important as change of air and surroundings is a duly liberal supply of nutritious food, including sound malt liquor or a glass or two of wine. Cod liver oil in cold weather, Fellows' syrup of the hypophosphites, steel and quinine, or the old-fashioned perchloride of mercury and bark, are the most suitable medicines. The testes should be carefully suspended; otherwise, as long as the deposit is in the first stage the more it is left alone the better. The use of iodine, oleate of mercury, &c., are only likely to hasten softening.

(*b*) **Surgical Treatment.**—This includes: (1) **Opening abscesses and scraping them out**; (2) **the use of the cautery**; (3) **castration.**

(1) **Opening and Scraping out of Abscesses.**—I advocate this step most strongly. As soon as ever a nodule is noticed to be softening—*e.g.*, in the epididymis—it should be opened at once and be scraped out like any other tubercular focus. It is now recognised that it is futile to leave tubercular glands in the neck to open spontaneously and tediously to evacuate their contents at the cost of much time, loss of health to the patient, disfiguring scars, and, after all, the risk of "residual" trouble many years later. We recognise that time, strength, and money are all saved by opening these glandular abscesses early, and thoroughly scraping out their contents with a sharp spoon. And if this is wise treatment in the case of the glands in the neck, it is far more urgently indicated with a gland so much more important as the testicle, and with such infinitely more important annexa, to which its mischief may spread.

Where the skin is not broken, the patient being brought under ether or the A.C.E. mixture, the abscess is opened with a small bistoury, and all the pus that escapes readily—*i.e.* without squeezing—having come away, the surgeon makes out the direction and number of fistulæ with a probe, and then scrapes them out and the cavern (into which they lead) with sharp spoons. These should be used most thoroughly until every trace and every recess of any cavern* has been repeatedly gone over and all caseous or cretified material, or tubercular granulations, ill-formed pus and lymph are thoroughly got rid of. Any bluish, purple, undermined or affected skin is thoroughly snipped away, counter-openings made where needed for drainage, and one or more small drainage tubes introduced. A powder of iodoform, 1 part, boracic acid, 2 parts, is then blown in and the parts dressed for a few days with hot boracic acid lotion, and kept well up on to the patient's pubes as he lies in bed. The drainage tube may be removed in twenty-four hours, and the patient may get on to a sofa a few days after the operation. The date of his getting up must depend on the amount of interference which has been needful. The patient should be warned at first that it may be necessary to repeat this step in a few weeks' time, if it become clear, from the continuance of swelling, or a sinus with prominent granulations, that some of the mischief persists.

The after-healing will often be promoted by sea-side air, or by the operation being performed at the sea-side.

The treatment of scraping is especially adapted to these cases where the lesions are limited to the epididymis; where the most careful examination fails to find anything in the testis, cord, vesiculæ or prostate; where the lesions are only one or two in number; where after being long in formation and quiescent they have slowly softened. Where opposite conditions are present, or where the tunica vaginalis is involved, this method is contra-indicated.

Again, if the cord, prostate and vesiculæ seminales are distinctly involved, this method will be futile. In cases where one testicle is so damaged as to call for castration, and a small softening nodule exists in the opposite epididymis, the sharp spoon and iodoform may be made use of in the latter. In all cases an anæsthetic must be employed and the mischief as thoroughly dealt with as possible. Attempting this with one of the scoops sold in dressing-cases, and without the aid of an anæsthetic is as futile as it is foolish. Tubercular disease should be looked upon as malignant, and treated as such, not in a way which trifles with it, and courts recurrence.

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* The surgeon must be as careful here to hit off every focus, just as he is, when scraping out suppurating glands in the neck, to find the opening in the deep cervical fascia by which the suppurating sub-fascial gland communicates with the subcutaneous abscess. Sir J. Lister's spoons with their double curve allow of the cavities being cleaned out with more telling effect.

(2) **Use of the Actual Cautery.**—This has been strongly advocated by Prof. Verneuil (*Bull. de la Soc. Anat.*, 11 Oct. 1871), whose chief reason for preferring this method to castration is as follows. Every operation on a tubercular deposit, but especially scraping out abscesses, by its necessary opening up of numerous vessels, risks a general outbreak of the disease, or an auto-inoculation of the patient. The incorrectness of the above argument has been proved over and over again by the host of successful and lifelong results which we obtain, nowadays, from excision and erasion of tubercular joints—*e.g.*, the knee. Prof. Verneuil goes so far as to apply his objection to castration. The patient being placed under an anæsthetic, a pointed cautery (of the kind sold with the Paquelin's apparatus) is plunged into the fistulæ so as to reach the deeper parts of the disease. Here the iron, kept of a bright red heat (otherwise, if it cools it sticks to the parts around), should be rotated in different directions, so as to make the destruction as complete as possible. It is then withdrawn, and, by gentle squeezing the cheesy softened stuff which has been detached, is extruded. This process is continued through the enlarged orifices. The reaction is said to be slight, and when, in from five to eight days all the sloughs and burnt shreds have come away, the process is repeated if needful.

I have no experience of this method, but it seems to me inferior to that by the sharp spoon, in two points especially. The heated iron is less handy and manageable than a sharp spoon, and secondly, by causing subsequent sloughing about the charred parts, it is more likely to lead to widespread inflammatory softening involving the tunica albuginea, and thus to subsequent protrusion of the testicle. If the tunica vaginalis be the seat of a tubercular hydrocele, this method will of course be useless by itself.

(3) **Castration.**—On this point surgeons are divided into two camps of opinion, those who would remove the testicle early, and those who never thus interfere till a late period of the disease. In the first case the castration is called primary or "preventive," from the object with which it is performed, in the other it is called secondary. Let us review the chief arguments (α) against, and (β) in favour of, early removal of a tubercular testis.

(*a*) The *objections* which have been put forward by Prof. Verneuil (and thus his reasons for preferring the use of the cautery) and by other surgeons are as follows:—(1) The operation is a useless one; a tubercular testis is but a local manifestation of a general disorder, and if this be removed the disease will show itself elsewhere. This is proved to be incorrect by our experience gathered from the results of excisions or erasions of tubercular joints, or operations on tubercular glands, which absolutely and convincingly proves that if these diseases are taken in time and dealt with thoroughly, the results of the above steps are of permanent excellence. Either the disease is localised or it is not. If it be localised, removal of it may save the patient; if it have already gained deeper parts, removal of a diseased organ which by its suppuration affects the patient's strength and mind, and which, if left, will infect deeper parts still more extensively, will improve the general health, and by its preventing still further infection of deeper parts, reduce the mischief already done to a minimum, rendering it perhaps quiescent for a long time, and thus putting it in a favourable condition for being encapsuled.

(2) Tuberculosis of the epididymis and testis sometimes ends in complete healing with preservation of the organ. While I do not deny that this may very occasionally be brought about by the breaking down and extrusion of caseating deposits in the epididymis, and even more rarely by the disease taking that most unusual form of tubercles which lie scattered in the parenchyma of the testicle itself, running their course without inflammatory attacks, remaining quiet and little by little being transformed into the fibrous variety mentioned at p. 337, the testicle atrophying and the cure remaining permanent, I maintain that this is one of the very rarest results in surgical pathology. The course which tuberculosis runs here is much more in accordance with what we know of its life-history elsewhere. Above all other characteristics it is essentially destructive, and usually progressively so. First deposits slowly and insidiously formed, then caseating and breaking down with suppuration and destruction of the parts first attacked, gradual extension to other parts close by, and the same process repeated here with periods of quiescence alternating with that of inflammatory attacks and greater activity, until the whole organ is more or less completely destroyed or other parts involved in the same process—this is repeated until a life, rendered invalid for years, closes amidst complications which render it insupportable. This is proved

by such cases as those given at p. 360, which I might multiply indefinitely.

(3) The operation of castration is from the loss of the organ which it entails peculiarly liable to be followed by hypochondriasis, and even by suicide. This is especially likely to be the case in tubercular disease of the epididymis and testicle, which is so frequently bilateral. There is, no doubt, some strength and truth in the above argument in cases of sudden loss of the testicle from injury or rapid atrophy. But the mutilation is not of the same moment in a case where the sexual organs have long been the source of suffering and the causes of interference with active life and of repeated trouble. The patients are usually aware that their virility is seriously impaired, and if they are assured as well, that their general health will gain by the operation, they will usually submit to it.

(4) Several French surgeons have advocated the use of the cautery or the sharp spoon in preference to castration because it leaves to the patients the remains of a sexual gland, and what they call the "illusion of virility," or "un testicule moral." This argument would carry some weight if we could ensure by the above operations such complete destruction of the tubercular material as to leave a relic of a testicle which shall remain quite sound, and free from all future sources of peril and discomfort to its owner. But in truth this is not what experience allows us to hope for; it is only in the case of one or two small deposits limited to the epididymis and taken early that erasion can be relied upon. In other cases there is every probability that the tubercle will have reached the testicle, though here it may be imperceptible. If erasion or the cautery be relied upon in more advanced cases, it is certain to end in a testicle with unhealed fistulæ weakening the patient with their discharge, spoiling the activity of his life, requiring regular dressing of some kind, and causing what remains of his testicle to be but a poor "consoling illusion" to him, while an insidious but inevitable extension is taking place to deeper parts.

(5) The objection that castration is a dangerous operation and may considerably shorten the patient's life, needs no time wasted in answering it. It is completely and decisively met by the results of antiseptic surgery of the present day.

A special objection has been made to castration because tubercular disease of the epididymis and testis is often bilateral, and due attention must be paid to this fact. But, on the other hand it must be remembered that the disease when bilateral is not always similar on the two sides in severity and extent. While on the side in which the tuberculosis is more advanced castration should be performed, the sharp spoon may be thoroughly applied to an earlier lesion in the opposite epididymis. Unhappy, indeed, is the outlook where the disease is bilateral, the prospect is always present that the caseating deposits, now certainly multiple, will with greater certainty lead to suppuration, exhausting the patient, spoiling his life, and inevitably leading to more rapid invasion of the prostate, bladder, &c., and their consequent attendant miseries. But while a double castration may be, now, less likely to be permanently successful, it is not the less called for.

To sum up the treatment which I would recommend for tubercular disease of the epididymis and testicle:—In the very earliest stages while the deposit is not yet softening, everything should be done, as directed at p. 363, to improve the general health and hygienic surroundings of the patient. If the deposit still persists, but without softening, the question of treatment is, I think, an open one. Most surgeons will be content to continue on the same lines, with the addition of mild counter-irritation by iodine, silver nitrate, or oleate of mercury, the affected part being carefully protected, and suspended. But while this treatment is justifiable in all, it is applicable especially to those patients whose means permit of their availing themselves of every possible advantage, and, above all, of frequent medical supervision. But with patients less fortunately placed, the outlook is very different. I have never seen a single case in which treatment on general lines, within the air of a hospital, did the slightest good. I have watched such cases remaining stationary sometimes, but I never saw one which could be said to improve, though the patient left and was lost sight of, satisfied in his own mind with his condition. On the other hand, I have often seen these cases, especially when bilateral, become decidedly worse both locally and generally. Therefore, we could not be blamed, if, in these cases of early deposit not yet softened, knowing the hopelessness of spontaneous cure and the certainty of what the future will bring, we resected these early deposits in the epididymis fully and thoroughly, trusting to the antiseptic details at our disposal, to prevent a hernia following. I should prefer resection in these cases to the use of the cautery-point with a view of hastening the process of softening, and thus facilitating the use of the sharp spoon. By performing resection the surgeon knows more exactly what he does, is more certain of maintaining asepsis, and less likely to produce a hernia by his interference. The case of resection by Billroth of nodules in the epididymis dating to old gonorrhœas, referred to at p. 277, proves that the above results may be obtained by skilful hands.

It is not to be disputed that such treatment, especially if bilateral, will probably lead to wasting of the seminal gland and to sterility. But few surgeons who are familiar with the course taken by tuberculosis if left to itself, will look upon these as other than lesser evils in the choice which lies before them and their patients.

In a somewhat later stage, where the nodules are already softening, the advice to be given is much plainer. The sharp spoon should be promptly and efficiently applied, this being repeated after a while, if needful, and the antiseptic precautions advised at p. 365, made use of. There should be no longer that loss of precious time, which is, nowadays, still so common, and which is not only so futile but so pernicious, leading the patient, by the holding out of false hopes or by the concealment of the truth, into a fool's paradise and nothing else.

On the question of **castration** my opinion has already been fully given when the arguments against this mode of treatment were discussed. It only remains to mention those particular instances in which I think this step is called for: (1) Where the treatment of erasion fails in lesions still limited to the epididymis. If one or more discharging fistulæ still persist here, especially if the patient is not in a position to avail himself of a repetition of the operation at the seaside, castration should be performed, slight as the mischief seems to be. It is only too probable that small deposits are already making their way into the testicle itself, by spreading along the rete, a condition extremely difficult to make out by external examination. (2) Where after erasion the fistula or fistulæ have healed, but careful watching of the patient, which must always be insisted upon, detects the existence of, it may be slight, but persistent swelling, with night sweats, and loss of flesh. These may point to mischief connected with the remains of the sexual gland, and not, necessarily, to that in the prostate, &c., or in the lungs. (3) Where the body of the testicle is involved. When this remains enlarged, irregular in outline and liable to attacks of sub-acute inflammation, tenderness and pain, castration should be performed. If a medical man encourages a patient with several nodules in the testicle or epididymis to leave these untreated, there is always a grave risk that these, which are already potential sources of mischief, will be lit up into fresh activity, eventually fatal, by some trifling injury or pyrexial attack. (4) Where the testicle remains small and atrophied, and riddled with fistulæ, one or more of which persist in discharging, removal of a useless and dangerous organ should always be practised. (5) Where a hydrocele is present, especially if purulent. Even in cases where a hydrocele, co-existing with tubercular disease of the epididymis or testicle, resembles an ordinary hydrocele closely in its naked-eye characters, bacilli must be carefully excluded both by the microscope and inoculation tests before the fluid can be pronounced to be innocent.

The Influence of Co-existing Disease in the Vesiculæ Seminales, Prostate, &c., on Castration.—I trust I have not seemed to make light of the frequency with which these secondary deposits are present. But I am strongly of opinion that this frequency is, in the great majority of cases, due to the delay with which the primary lesion is treated, and the slight importance usually attributed to it, which later on lead to such disastrous results.

If in these early days small deposits were *at once* treated with the sharp spoon, or even by resection, and, in severe cases, by castration, there would not be time for these secondary deposits to have reached parts inaccessible to the surgeon.* In those cases where a rectal examination gives reason to suspect the existence of these deeper deposits, castration should, I think, be still recommended when these deposits are yet small and probably of recent date, and when the patient's general condition still admits of the repair of the quickly healing wound which castration leaves. For if we have every reason to fear that these deposits may ultimately enlarge, soften and suppurate fatally, we may certainly hope that by removal of the primary focus below, and by ridding the patient of a nuisance which spoils the activity of his life and wastes his strength by suppuration, and thus by restoring him to a healthier condition of life, both mentally and bodily, we shall defer the evil day, even if we do not improve his condition so much that these deeper lesions may even retrograde as they do, though far too occasionally, elsewhere.

Influence of Pulmonary Lesions upon the Question of Castration for Tuberculosis of the Testicle.—I have elsewhere expressed an opinion that serious phthisis is not so frequently present in these cases as was formerly believed to be the case. Tuberculosis here tends to kill by general invasion of the genito-urinary system. It remains to consider those cases in which the presence of phthisis affects the question of castration. When the disease is at all acute and progressing, careful examination must be made of the prostate and vesiculæ; if these are sound, advanced phthisis need not, *per se*,* deter us from relieving the patient of a source of weakening suppuration and pain. Even with the advantages of these days of aseptic surgery, which have so altered the disturbances of pyrexia, pain, &c., which used to follow operations, I would not seem to infer that where the mischief is acute, advanced, and progressive, that castration is an operation which may be undertaken lightly. I only wish to point out that where a patient has to bear the double burden of tuberculous lungs and of a suppurating, crippling, perhaps painful tubercular testis, we need not be deterred by the condition of the lungs from relieving him of one of his burdens. Chloroform should be given to avoid irritation of the lungs, every care should be taken to promote early aseptic healing, not only because delayed healing will defeat the object of the operation, but because suppuration, pyrexia, &c., may light up tubercular deposits hitherto quiescent. Special attention must also be paid to the patient's diet, to the hygiene, airiness, sunny aspect, &c., of his bedroom. As soon as possible he should be got on to a sofa, and it will always be well, if possible, to perform the operation at the seaside.

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* The question of attempting to extirpate the vesiculæ seminales is treated of in Pt. iv. DISEASES OF THE VESICULÆ SEMINALES.

The Operation of Castration for Tubercular Testicle.—The operation itself is fully described at p. 437. I have only to add one or two points of special importance here. If there be multiple fistulæ, or if the scrotal skin be extensively involved, every atom of the disease here must be removed. This can usually be done by making the incision single above and elliptical below so as to include all the unhealthy parts. If this is impossible, which will very rarely be the case, the sharp spoon, and, if needful, silver nitrate or zinc chloride (gr. xv.–℥j) must be thoroughly employed, and their use repeated later on, if tardy healing, prominent fistulous granulations and persistent discharge, render this advisable. If after the operation any suspicious, blue, undermined edges of skin are left, these should be freely clipped away with sharp scissors so that a source of infection and recurrence be not left.

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* For cases supporting this view I would refer my readers to an account of two cases of amputation of the forearm for disease of the wrist, with advanced phthisis, followed by good recovery, by Sir W. Savory, *Lancet*, vol. i. 1878, p. 273; and four similar cases reported by Mr. Howard Marsh, *Brit. Med. Journ.*, vol. i. 1883, p. 1121.

The cord should always be divided as high up as possible. When there is reason to suspect the existence of any of the diseased conditions described above at p. 339, it will be worth while, where thorough antiseptic precautions can be carried out, to prolong the upper end of the incision over the lower half of the inguinal canal, to slit this up, and then, the upper angle of the wound being vigorously retracted, to detach the cord from its surroundings as high as the internal ring, and to divide the cord at this point. Especial care must be taken in these cases to first transfix the cord, and secure it with a double ligature imbedded in its substance, before it is divided. If this precaution is not taken, and a single ligature only employed, this is almost certain to be inefficient, and, owing to the amount of tension on the cord, now pulled down, to slip later on, and lead to most serious, if not fatal, hæmorrhage. The layers of the abdominal wall which have been divided should be united by buried sutures of sulphuro-chromic gut, due drainage being provided.

After the castration the patient must be carefully watched, and every precaution taken to place him under the best hygienic surroundings possible (p. 363).

Tuberculosis of the Testicle in Infants.—This is more common than used to be thought the case, and the diagnosis between this and syphilitic affections is not always easy. MM. Hutinel and Deschamps have published (*Arch. Gén. de Méd.*, 1891, t. i. pp. 257, 453) a valuable paper from which most of what follows has been derived. They look upon tubercular lesions of the testicle as not much rarer in infants than after puberty. This must be contrary, I think, to the experience of most English surgeons. During the twelve years in which I have been surgeon to the Hospital for Children and Women, only four cases have been admitted under my care, and during the sixteen in which I have seen out-patients at Guy's Hospital the proportion has been smaller still, and, though I admit that the testicles of infants are not parts which are included in the examination of tubercular affections, on the other hand, the rapidity with which the mother's attention is drawn to any swelling here, and her anxiety to obtain advice for the smallest morbid condition, make me think that these cases, if common in England, would have been more noticed, The above writers account for the fact that tuberculosis of the testicle has had too little notice at this age, by the functionless condition of the gland, and the slow and painless way in which the disease usually sets in. They suggest, as causes which must not be overlooked, the congestions of masturbation to which infants and young children are notoriously addicted, and which may lower the vitality of the organ. As to the mode of entrance of the bacillus, they call attention to the frequency with which they have noticed tubercular peritonitis to precede tuberculosis of the testicle. This connection is probably reciprocal. In two cases of tuberculosis of the testicle in infants, in which, owing to the disorganised state of the organ, I performed castration, I found the processus funiculo-vaginalis open in its whole extent. In both its inner aspect was shotty with miliary tubercle as high as it was possible to follow it. In one, the cord contained a mass of tubercle, closely resembling a caseous lymphatic gland, and, in this case, tubercular peritonitis followed within two weeks of the operation. Both children made good recoveries.

The left side is thought to be most frequently attacked, and M. Jullien (*Arch. Gén. de Méd.*, April 1890) gives the following ingenious explanation. Under the age of two he found both sides attacked equally. After this time, when the child usually begins to walk, the left testicle, being the lowest, is most exposed to injury, and thus the predilection for the bacillus for this side is accounted for. This explanation is, M. Jullien thinks, supported by the absence of tubercular lesions in testicles not descended. As in the adult, the onset may be chronic or acute, but the former is, here also, the most common. In the infant the testicle is often much damaged without the epididymis being attacked, and while the reverse may be the case, the testicle is more often diseased than the epididymis. The cord is seldom, and the vesiculæ seminales and prostate very rarely, found attacked. But the following case of Dr. Carpenter (*loc. supra cit.*) shows that it is worth while to examine these parts carefully in little children. B. E., aged two and a quarter years, had suffered for four or five weeks from a swollen testicle. His mother had three miscarriages prior to his birth, and he was the first child born alive; there had been two children since. He had neither rash nor snuffles. There was a strong " asthmatical " history in the family. The child was rickety. The right scrotum was a little blue; the testicle on this side was about the size of a walnut, it was quite hard, but, at one point, an area of softer tissue could be detected. The cord was much thickened and indurated, it was quite as large as the stem of a wooden stethoscope, at one part there was a ridge of harder tissue, cartilaginous in consistence, apparently the vas. *Per rectum*, as far as the finger could reach, a mass of infiltrated seminal vesicle was detected on the right side. It could be felt with the greatest ease between the finger in the rectum, and those placed on the abdominal wall. Dr. Carpenter points out that the history was confusing and the testicle not to be distinguished from a syphilitic one, but the implication of the vas and seminal vesicle at once decided in favour of tubercular orchitis. The same writer, from the histology of these cases in infants, the facts that the epithelium of the ducts is but little developed, and that the mischief rarely reaches the testicles of these patients from the bladder or prostate, would conclude that, whatever may be the case in adults, the bacillus arrives here by the blood-vessels and lymphatics, and not by the ducts. In the diagnosis there are two chief affections to distinguish the tubercular affection of the infant's testicle from—viz., syphilis and sarcoma. With regard to the first, syphilis, which also appears in very young infants, is more frequently double and symmetrical, and less frequently attacks the epididymis. But the presence of other evidence of congenital syphilis, the history, and the results of specific treatment will be more valuable tests, to which the absence of any tendency to suppuration and a normal condition of the vesiculæ and prostate may be added.

With regard to *sarcoma*, MM. Hutinel and Deschamps point out that there is a form of tuberculosis which may simulate malignant disease. It is the form where the testicle is much enlarged by tubercular material in which fibrous tissue predominates. Thus, in one of their cases, a section of the testicle showed no gland tissue. The field was everywhere occupied by fibrous tissue arranged in sections of circles, each circle corresponding to a tubercular focus, with a giant cell and a thick layer of embryonic connective tissue, with, here and there, scattered bacilli. This connective tissue proliferation is thought to show a reaction in favour of fibrosis rather than caseation. The large size may suggest sarcoma, but the rapid increase of the latter, together with the other points given above, will clear up the diagnosis.

CHAPTER VII.

FUNGUS, OR HERNIA OF THE TESTIS.

THIS may occur under **three conditions**. (i) In the course of **tuberculosis** of the epididymis and testicle, during the second stage, when softening and suppuration have taken place in one or more of the caseous masses. (ii) In the course of **syphilitic** orchitis. Whether this condition has ever followed on any other form of epididymitis or orchitis, is, I think, doubtful. (iii) In **malignant** disease—*i.e.*, medullary sarcoma, or encephaloid carcinoma, constituting "fungus hæmatodes." This last condition differs from the other two in that the protrusion, when once it has started, is much more rapid; further, it contains no true testicle tissue. It is alluded to below (pp. 387, 400).

Owing to improved methods of treatment and the earlier date at which, owing to the use of anæsthetics, castration is permitted, all the above varieties of hernia testis have now become extremely rare. A great deal has been written about their mode of origin, but as protrusion of the testicle is now practically a thing of the past, the subject will only be alluded to here very briefly.

Excluding that variety of hernia testis which occurs in malignant disease, and in which the protrusion is simply a sloughy mass of new growth, and also that form in which the testicle itself protrudes after an injury, and which will be alluded to later, I shall speak here particularly of the **tubercular** and **syphilitic** "fungus." **Two forms** must here be remembered.

(A) **The Superficial Variety.**—Here the protrusion consists only of granulations and inflammatory material springing from the outer aspect of the tunica vaginalis or tunica albuginea. In other words it contains no true testicular tissue.

(B) **The Deep, Glandular, or Parenchymatous Variety.**—Here the glandular tissue itself of the testicle or epididymis projects through an opening in the tunica albuginea, and, however altered by inflammation the results of the fungus may be, seminal tubules may be found in it.

The above distinction has been insisted upon by M. Jarjavy (*Arch. Gén. de Méd., juin* 1849). While it is a useful classification to remember, it will be seen below that in the development and structure of the fungus other varieties have to be remembered.

Development and Pathology of the Fungus.

These will vary with the variety. Putting aside for the present cases of growth, of protrusion after injury, and those extremely rare cases in which a similar condition has followed on some sloughing cellulitis of the scrotum, as in erysipelas or extravasation of urine, we have to consider tuberculosis and syphilis as causing the development, and as explaining the pathology of nearly all cases of so-called fungus.

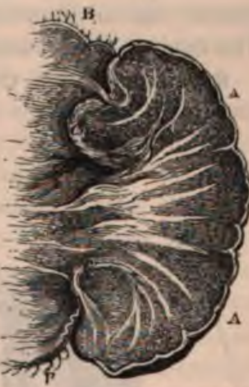
(*a*) **In Tuberculosis.**—Here the hernia may arise in one of the following cases:—(1) It is usually described as occurring after caseation and suppuration with discharge of the softened tubercular material. It is generally noticed on the outer part of the testicle, in connection with the infiltrated portion of the epididymis. In other cases it occurs in connection with the testicle itself and is situated more anteriorly. Several sinuses usually co-exist. In this, the parenchymatous or deeper variety of fungus, the testicular tissue is more rarely found than in the syphilitic hernia testis, as owing to the greater disorganisation brought about by the formation and ulceration of caseous deposits, the seminal tubules at the spot corresponding to the fungus have been largely destroyed. In other words, the fungus here springs from the cavity of a tubercular abscess.

(2) The hernia testis now originates not as a tuberculosis of the epididymis or testicle, but in the softening of one or more caseous nodules situated primarily in the scrotal tunics. In other words, the primary degeneration is not in the glandular tissue, but in its coverings. The exact seat of the tubercular deposit which, by breaking down, starts the process has been disputed. MM. Monod and Terrillon (*loc. supra cit.*, p. 493) think that the mischief starts in the tunica vaginalis, and, in support of this view, rely on the frequency with which this sac is attacked in tuberculosis of the testicle as shown by Simonds of Hamburg and others (p. 337). Suppuration, set up in some deposits here, gradually thins and perforates the parietal layer of the tunica vaginalis and the overlying scrotal tunics at a certain spot. Subjected then to various irritations and exposed to the air, the hernia covers itself with granulations. Another view is that of

M. Réclus (*De la Tuberculose Primitive des Bourses Congrès franç. de Chir.*, 1886, p. 491; and *La Semaine Méd.*, 1887, t. vii. p. 30). This observer, a very high authority on the diseases of the male sexual organs, especially those due to tubercle and syphilis, thinks that the original tubercular nodule is situated in the scrotal tunics. The following cases brought forward by M. Réclus prove this origin of a hernia testis, which is therefore of the superficial variety, but as the condition of the tunica vaginalis is not given, the exact starting-point must still remain doubtful, whether in the tunica vaginalis or in the more superficial scrotal tunics. The first case was that of a drunkard, clearly tuberculous, whose left testicle was stated to have swollen all at once, to have rapidly suppurated, leading to a hernia in the front part of the scrotum. Castration was performed. The testicular parenchyma was nearly healthy, only a few recent granulations being found in its periphery near to the tunica albuginea. In the epididymis were three small foci encapsuled in thick fibrous layers. It was evidently not these lesions which had led to the hernia testis. The mechanism of this was explained by certain alterations in the scrotum. These consisted of tubercular foci, one of the size of a pea, the other that of an almond, very much earlier in date than those in the testicle and epididymis. The orifice that the testicle had passed through was the remains of a third abscess, similar to, but much larger than, those just described. In the second case, a patient of twenty-six, an abscess formed in the right half of the scrotum, and was opened. Some months later a fresh attack led to loss of substance of the scrotum, and a hernia followed. The patient dying of phthisis, the testicle was found to be healthy; a part only of it, covered by the tunica vaginalis, had escaped through the opening. The epididymis was lost in very thick fibrous tissue of new formation, and contained a small caseous nodule. In this case, as in the other, the insignificant lesion, surrounded by dense fibrous tissue, could not be the origin of the scrotal ulceration. The third case was that of a patient with hernia of the right testicle. The epididymis could be felt, but there were no evidence of any tubercular mischief in it, and there were no fistulous tracks. The state of the left side of the scrotum explained the mechanism of the protrusions on the right side. The skin here was swollen, thickened and purple, and in front had opened, giving exit to a large quantity of grumous fluid. A probe introduced entered an extensive fistula between the skin and the gland. When the cavity was laid open it was found to be lined by exuberant granulations. When these were detached, the white, shining tunica albuginea could be detected beneath. The cavity was quite independent of the epididymis. If the patient had continued to go about, he would have had a double hernia testis, a very rare affection. In support of this explanation that the primary change is in the scrotal tunics, M. Réclus points to the fact that in Professor Syme's operation (p. 383), of resecting the diseased tissues and suturing the cut edges over the hernia testis, primary union is occasionally secured. This would not occur if the mischief began in the deeper parts below.

Morbid Anatomy.—This too, will vary as the tubercular fungus springs from a point superficial to, or from one within, the epididymis or testicle. (i) In the superficial variety, the projecting mass will probably be less thick and massy, as here the deep parts of the organ are not directly continuous with it. But, however superficially the hernia may have originated, inflammatory thickening of the subjacent tunica albuginea will always be present, often to a considerable degree, and the nearest part of the testicle will also be affected by the chronic inflammation, though not projecting. A section of the part is always required to demonstrate fully the exact relation of the parts, and how far the deeper parts may be affected. (ii) In the parenchymatous variety such a section will show that the fungus, here thicker and more massy than in the first variety, is continuous with the exterior of the epididymis or testicle. The hernia here also consists of granulations usually abundantly vascular, and of tracts of fibrous tissue more or less prominent. In this variety the tunica albuginea is no longer still entire, though inflamed. Around a perforation of varying size, it is found to be incomplete, and its edges, as in Fig. 54, may be found everted. In this preparation, which is in the London Hospital College Museum, nearly the whole of the glandular tissue is external to the scrotum, the mediastinum testis being beyond the surface of the skin. The tunica albuginea is also thick-

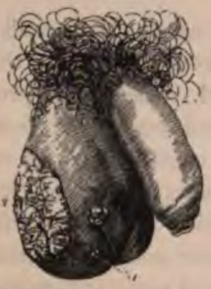
FIG. 54.



Section of a tubercular hernia testis. A A, The hernia B B, Scrotum. C C, Everted tunica albuginea. (Curling.)

ened, and the scrotal skin around the fungus also indurated and slightly undermined. The pedicle of the fungus, according to its size, will be found to blend with either testicular tissue and the mediastinum, or the epididymis. According as the width of the pedicle varies, the deeper fungus may be more or less accurately compared to a mushroom, of which the base blends with the deeper parts, the neck is surrounded, first with a varying degree of tightness, by the perforated tunica albuginea, while the top projects above the scrotal skin. The existence of seminal tubules has been a good deal discussed, and their presence has been spoken of as a diagnostic point between the two chief varieties, superficial and deep. But the presence of seminal tubules is not constant in the latter, in which, of course, they are only to be expected. For, as already stated (p. 377), the caseous deposit which has given rise to the hernia may, during its formation and breaking down, have completely destroyed the gland tissue at this spot. In other cases, especially in the deeper and central parts of the fungus, brownish-yellow tracts or masses may be detected, which, when teased out or unravelled, prove to be altered seminal tubules. The cavity of the tunica vaginalis is obliterated.

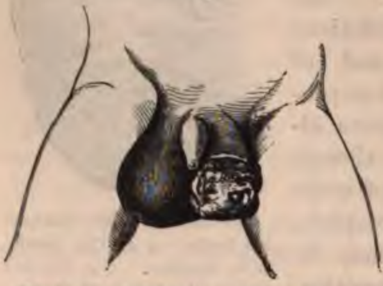
FIG. 55.



Hernia testis, probably tubercular. (Curling.)

Symptoms and Course.—The hernia usually appears as a mass, varying in size from a strawberry to a walnut, of red or reddish-yellow granulations. Around this there is a circular or oval gap in the scrotum, the edges of which are altered by chronic inflammation and often undermined. The surface of the fungus is moist with unhealthy, sero-purulent discharge, sometimes copious, and causing irritation of the adjacent skin. The mass itself is usually not sensitive; when taken between the finger and thumb it is generally painless, though in cases where the deeper parts contain testicle-tissue but little altered, testicular sensation,

FIG. 56.



Hernia testis, probably tubercular, in an infant. (Curling.)

though modified, will be detected. But this point, as distinguishing the superficial from the deep variety of fungus, is by no means always easy to apply, or reliable.

Diagnosis.—The chief object in the case of tubercular mischief is to distinguish the superficial fungus from the deep, as the prognosis given may vary in each case. The main points by which the two may be distinguished, are the existence of a very little aperture in the tunica albuginea, the detection of which, aided by a bent probe, is often a matter of much difficulty, the presence in the fungus of tubules which can be unravelled, or of spermatozoa in the discharge, and the existence of a well-marked pedicle. The hernia of a syphilic testis will be usually distinguished by other evidence of this disease, the history, and by the negative results of an examination of the prostate and vesiculæ seminales. The fungus hæmatodes is so totally different in every respect as to need no further notice here.

Prognosis.—While a hernia in tuberculosis of the epididymis or testicle, is, like those due to other causes, liable to inflammatory attacks and partial sloughing, it differs from them in the gravity of the outlook. In any case, natural, permanent repair is not to be hoped for, and when much disease is present, as where the epididymis and testicle are deeply affected, or when much of the testicle has protruded, there is no use in deferring castration.

Treatment.—This, in the case of the tubercular fungus, may be summed up in one word, castration, supposing that the general condition of the patient is favourable to this step.

(β) **Hernia of a Syphilitic Testis.**—Of late years this condition has, owing to improved diagnosis and treatment, been becoming very rare. It used to be not uncommon in the later tertiary gummatous form of syphilitic orchitis, and occurred usually in broken-down cachectic subjects, in patients of strumous diathesis, or in those who had been exposed to want, or to the lack of, or to unwise, treatment. Nodes, ecthymatous eruptions, and severe ulceration of the mouth and nose were not unfrequently found to be present at the same time. Hernia of a syphilitic testis may begin in one of the following ways: (1) In the breaking down of a gumma which happens to be situated near the surface of the testicle (Fig. 43), or in one more deeply placed. As one or other of these breaks down, the tunica albuginea is gradually more and more implicated, and becomes softened and thinned. The overlying skin and cellular tissue, at first inflamed and adherent, gradually ulcerate, thus allowing of a protrusion which consists of the yellowish-white mass characteristic of a gumma, with, here and there, traces of tubular tissue in the shape of little masses which admit of being unravelled. Exposed to the air and other irritation the fungus becomes covered with soft granulations, red or greyish-red, and sero-pus mixed with slough. It is usually somewhat firm, painless, and not inclined to bleed readily. It consists of granulation tissue, connective tissue and vessels, and that some of the seminal tubules are still present, and permeable, is shown by the fact that spermatozoa may be detected in the discharge upon the dressings of these cases. The skin and dartos, at first ragged and ulcerated, tend to contract with a ring-like cicatrix around the hernia, which thus often becomes pedunculated and mushroom-like (p. 380). It is seldom large, and the testicle has usually become much reduced in size, when the parenchymatous or deeper form of hernia takes place. The amount of the protrusion varies from a small nodule to the whole substance of the testicle. In these latter cases the entire glandular tissue, and with it the mediastinum, is projected through the tunica albuginea, and stands out beyond the level of the scrotum, much as in Fig. 54. But, as a rule, the protruding mass is not very large.

In other cases the hernia originates in a gummatous inflammation of the tunica albuginea, somewhat similar to the gummatous inflammation of the periosteum in the later and more perishable nodes of tertiary syphilis. In another, very occasional, class of case the mischief arises in a gumma of the scrotal tunics, or in some ulcerative process started in the skin by syphilitic eruption. In all these the tunica albuginea is gradually exposed by destruction of the overlying scrotal tunics. The ulcer here shows a yellowish-grey floor, the scrotum around, adherent for some distance to the testicle, is thickened, reddish-purple, and perhaps undermined. One or more such ulcers may be present. The tunica albuginea, exposed by one of these to irritation, becomes covered with granulations, forming the superficial variety of the syphilitic hernia testis.

As the hernia due to syphilis of the testis is, like the deep gummata of the tongue, or rhagades, becoming, for the reasons already given, extremely rare, I shall pass on at once to the **treatment.** This is infinitely more favourable than in the case of the tubercular fungus. The superficial form will usually cicatrise quickly and soundly under judiciously given iodides, combined, perhaps, with a little mercury; strapping over iodoform or mercurial ointment being used externally. In broken down patients, good feeding, tonics, and sea-air are of course indicated.

The deep-seated fungus is much less amenable to anti-syphilitic remedies. Here the use of fuming nitric acid should be employed before castration is resorted to. When the size of the swelling is thus reduced, the surface of the fungus should be dusted with the red oxide of mercury (two parts), and iodoform (one part), or covered with a mercurial ointment and strapped over lint.

I should prefer the above to the method of Prof. Syme, in which, by means of an elliptical incision, the ring of tissues which tightly girts the hernia is removed, while at the same time the soft parts are carefully dissected up. The surface of the hernia is then scraped clean, and dusted with a little iodoform. Pressure is then made upon it, and the soft parts are adjusted over it with as little tension as possible, and held in position with a few points of carbolised silk and horsehair sutures, a drain of the last named material being first inserted. Irrigation with mercury perchloride solution 1–2000 should be employed throughout.

This operation is chiefly suited to protrusions of the superficial variety, moderate in size, and occurring in fairly healthy subjects. I used it thus successfully in one such case twelve years ago. But in many instances it will be found that, owing to the altered vitality of the soft parts, the stitches quickly cut their way through, the flaps recede, the hernia again protrudes, and but a slight amount of primary union is secured.

Shaving off of any part of a hernia testis is not to be thought of. There is not only the risk of removing healthy testis tissue, but this treatment is always followed by fresh protrusion. In the case of a very pedunculated fungus this may be treated by the elastic ligature, and pressure tried by strapping when the slough has come away.

(γ) While tuberculosis and syphilis are by far the most important causes of hernia testis there remains a third class of cases due to other causes. I have only space for the enumeration of these. There is scarcely any condition which causes destruction of the scrotal tunics which may not be followed by a protrusion of the testicle. Thus, this may be brought about by injuries and wounds, sloughing after the injection of iodine, or the radical cure by incision, gangrene, extravasation of urine, or the sloughing which may follow some fever—*e.g.*, typhus.

CHAPTER VIII.

NEW GROWTHS OF THE TESTIS, EPIDIDYMIS, AND TUNICA VAGINALIS.

Classification. — Arrangement of the Subject. — In any attempt to classify new growths of the seminal gland we are met by the following **difficulties.** (1) The microscopical examination of specimens shows a large number of varieties of new growths sufficiently distinct in structure to be classified under different names. But morbid histology has here outstripped clinical research. The conditions which we can now diagnose and distinguish at the bedside are but few in number, and by no means correspond in number or detail to those separately named and labelled apart by the microscope. (2) The new growths met with in the seminal gland are complicated by the frequency with which, in one growth, numerous tissues are combined. Thus, it is not uncommon to find different forms of the connective-tissue type—*e.g.*, fibrous, myxomatous, cartilaginous—all represented in one new growth. Some observers even go so far as to say that combinations of carcinoma and sarcoma may co-exist (p. 391). From this results the "mixed" character of many of the new growths here met with which places them in such sharp contrast with those met with in the breast. (3) The microscopical appearances found in a new growth of the seminal gland cannot be relied upon for rightly foretelling the degree of gravity which that new growth implies. Malignancy used in its old sense is in no way an adequate ground of classification. Thus, again and again, anatomically simple cystomata, fibro-cystoma, myxomata, chondromata have all been followed by secondary deposits in the lumbar glands. Perhaps this tendency of new growths of the seminal glands thus to disseminate themselves may be explained (*a*) by the irritations, congestion, &c., to which they are liable, (*β*) by the large lymph-spaces which naturally exist in the testicle, and which are intimately associated with its function—viz., the absorption of superfluous secretion.

MM. Monod and Arthaud (*Rév. de Chir.*, 1887, t. vii. p. 165; and *Maladies du Testicule*, p. 568) have elaborated a classification of new growths of the seminal gland, which is based on the ingenious and suggestive theory of Prof. Cohnheim,* that the main source of origin of new growths consists in certain relics of fœtal tissues, which, owing to their being superfluous or to their development being arrested, have never been matured or used up, but have remained quiescent for a while in the midst of better developed tissues.

But the very elaborateness of such a classification which has to find a place for all the minute distinctions made by histology between the different new growths met with in the testicle defeats itself, when an attempt is made to use it for practical purposes, for, as stated above, it has got altogether out of touch with the results of clinical work.

A far simpler, and one, histologically, less complex, will be adopted here.

SECTION I.

CARCINOMA.

Varieties.—While two forms of carcinoma are described as occurring in the testicle—*i.e.*, (*a*) **Medullary**, and (*b*) **Scirrhus**, the former alone is sufficiently common to need a detailed account.

(*a*) **Encephaloid Carcinoma.** (*Syn.* **Soft Spheroidal-cell Carcinoma.**)—It is well known how widely different specimens of this form of carcinoma may vary in the same organ, both in the amount and the firmness of their fibrous matrix. In the testis the cellular element usually largely predominates, delicacy and a high degree of vascularity being marked features in the fibrous stroma. On the other hand, the alveolar structure stands out very prominently, the alveoli being filled with cells which recall the appearance of the seminal epithelium.

Starting-point of Carcinoma Testis.—Birch-Hirschfeld (*Arch. d. Heilkunde*, Bd. ix. Hft. 3, S. 537, 1868) first proved that the disease originated in the glandular epithelium. He showed the resemblance between the cells of the gland and those of the new growth, and in a specimen in which a thin layer of testicle tissue still persisted around the carcinoma, he showed that intermediate forms existed, leading up from the normal seminal tubule to the alveolus of the carcinoma. The same observer showed by prolonged maceration of the growth in dilute hydrochloric acid that the seminal tubules become irregular in shape with sacciform dilatations and bulging of their walls. These enlargements and protrusions become crowded with proliferating epithelium, and, after a while, the epithelial cells are found to be no longer contained within the tubules, but to be passing into the surrounding tissues, and thus taking part in the growth itself.

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* *Vorlesungen über Allgemeine Pathologie*, Berli 1877, S 637, *et seq.*

This view, that there is a direct continuity between the seminal epithelium and that of the carcinoma, has been more recently supported by Langhans in his examination of some specimens of carcinoma testis for the second edition of Kocher's "Krankh. d. Hoden's," in Pitha and Billroth's *Handb. d. Chir.* MM. Monod and Terrillon while accepting the epithelial origin of the carcinoma reject the above view of the direct continuity between the cells of the gland and those of the cancer, and hold that the growth originates not in ordinary functional seminal cells, but in epithelial cells of embryonic type homologous with those of Pflüger's tubes in the ovary, and included in the seminal gland at some period of its development.

In what part of the Seminal Gland does Encephaloid Carcinoma begin?—There is reason to believe that the tubules in the centre of the gland near the rete testis are the starting-point of the disease. Specimens of the growth in an early stage, which are necessarily very rare, are alone valuable here, as all the structures soon become involved and destroyed by the disease, the whole being reduced to a carcinomatous mass, in which none of the natural components of the testicle can be traced. Prof. Kocher figures a specimen removed by Dr. Schärer in the early stage, which showed nodules of carcinoma pressing forward from the mediastinum testis into the testicle itself, and which he thought proved that the rete testis and the adjacent vasa recta are probably the first seat of the proliferation.*

Naked-eye Appearances of Soft Carcinoma of the Testicle.—The growth which soon forms a large and rapidly growing swelling, like many other morbid swellings of the testicle, is ovoid in shape, and regular and uniform in outline as long as the tunica albuginea has not become much thinned. It is most important to bear this in mind, as, otherwise, early castration, the only chance of really curing the patient, is liable to be deferred, the surgeon hoping that he has only an orchitis to deal with. As the disease progresses, the smooth uniform outline is lost, bosses appear at different points of the surface, and if the case is left to itself, the tunica albuginea gives way, the skin itself is involved, and a "fungus" of malignant growth makes its appearance.

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* Robin put this in the globus minor. Kocher believes that M. Robin was mistaken here, as the posterior part of the testicle itself may be so curved over the rest of the gland as to simulate the epididymis.

A section shows nothing distinctive between encephaloid carcinoma and the softer sarcomata. The mass is soft and pulpy in consistence, and, commonly, more or less white, pinkish-white, or a dark fawn in colour. When squeezed, a creamy fluid oozes from its cut surface at a multitude of points; and if a stream of water be directed upon it, the greater part is washed away, leaving a flocculent, filamentous, areolar structure, in the interstices of which the creamy fluid, which simply consists of dislodged cells, was contained. The mass is usually so soft, and the areolar framework so fragile, that it is liable to give way in consequence of a slight blow, or, without any such cause, blood may become effused in its substance. This may take place at many points, interstitially, or into ragged cavities formed by the pressure of the blood; and the effused blood undergoing changes gives rise to a variety of appearances and discolorations, varying from bright to black red. Sometimes the fibrous stroma consists merely of streaks, or delicate bands which divide up the mass into unequal parts; in other cases it is thicker and tougher, giving a firmer consistence to the mass and more resembling what is met with in scirrhus; it may also be arranged in places concentrically, so that the more fluid elements appear as if they were arranged in cysts.

These cavities may arise in different ways around extravasated blood, or about portions of the growth which are undergoing caseous, mucoid, or colloid degeneration. In other cases the cysts are of the true variety and develop from proliferation of the nuclei and cells of the connective-tissue stroma. Serum, often bloodstained, or glairy, mucoid fluid form the contents most frequently met with.

Changes due to the above-mentioned degenerations, especially the caseous or fatty, from interference with the blood supply of the cells by the rapid growth of the mass, are very common. Grumous, pultaceous, yellow patches are thus produced. Mucoid softening is also frequent. None of these changes are of much practical importance, or affect, materially, the progress of the disease.*

It is extremely rare to find any evidence of testicular secreting tissue in or about the growth. This distinctive point between carcinoma (or sarcoma) and adenoma or cystic disease, a disease which also begins in the rete testis, and also pushes the substance of the testicle outwards towards the periphery (Fig. 60), is thus explained by Kocher. In carcinoma or sarcoma not only is the sound parenchyma pressed outwards, but cellular proliferations breaking through and between the walls of the canaliculi, grow also between those which are intact.

Turning to adjacent parts we find that **the epididymis** is usually diseased, being often lost in the substance of the growth, as in any other rapidly growing tumour here. In twenty-three cases in which precise statements could be made as to the condition of the epididymis, Kocher found this body diseased in fifteen, and intact in only eight cases. **The tunica vaginalis** is usually found adherent; in early cases partially, in those more advanced, throughout its whole extent. This is brought about by chronic or sub-acute inflammation set up by the advancing growth. Any remains of its cavity will be found filled with serous or bloodstained fluid, but it is rare to find a hydrocele of any size. I have mentioned at pp. 233, 404, cases where extravasation of blood from a new growth into the cavum vaginale formed a malignant hæmatocele. This is a rare condition, and has not received the attention it merits.

Propagation and Generalisation of the Growth. — The starting-point and mode of spreading within the seminal gland has been described; it remains to speak of the parts which may be affected at a distance, a point obviously of great importance in its bearing upon the utility of the only treatment at our command.

This propagation may take place in any of the following ways (1) by the lymphatics; (2) by the veins; (3) by extension along the connective-tissue. The first means—by the lymphatics—

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* In a case described as "encephaloid carcinoma" which lasted more than five years, the unusually slow progress was attributed to the process of retrograde metamorphosis in the centre of the tumour nearly balancing that of growth at its circumference (*Path. Soc. Trans.*, vol. x. p. 203). As the disease here dated to a blow five years before, it is possible that the swelling was, for some time, inflammatory in nature. In another case of similar duration the mass was "firmer than usual" (*Med. Times and Gaz.*, vol. xx. p. 291).

is the most frequent. This is shown by the certainty with which, if the disease is left to run its course, and by the frequency with which, after castration, enlargement of the pelvic and lumbar glands takes place, large masses of the growth being felt between the pelvis and the ribs on the affected side, and found post-mortem extending upwards along the aorta and vena cava as high as the diaphragm. In these masses, the above vessels, the lumbar nerves, and the ureter may all be embedded and compressed, giving rise to miseries which will be mentioned later on. In some cases even the mediastinal and bronchial glands do not escape. The bodies of the lumbar vertebræ may be more or less destroyed,* and from the retro-peritonæal glands deposits may extend to the liver, mesentery, peritoneum, and lungs.

Microscopical Appearance.—This is characteristic of soft carcinoma, and needs no detailed account here. As in other viscera, the appearance is sometimes typical—viz., a well-marked alveolar, connective-tissue stroma, the alveoli containing cells of epithelial type. In other cases the histological appearances are not so easily determined. The alveolar arrangement is less marked, the connective-tissue stroma being embryonic in character, and rich in round or fusiform cells recalling a sarcoma. This is especially the case in the most rapidly growing part of the mass. In such doubtful cases where the alveolar arrangement is little marked, careful examination will usually find here and there a tendency of the stroma to group itself so as to form alveoli, or at least spaces which contain cells of an epithelial and not of a sarcomatous type.

(β) **Hard Carcinoma. True Scirrhus.**—There is no doubt that many cases of obstinate orchitis, especially of the syphilitic form, have been removed in former days as scirrhus, and have been placed under this name in our museums. This form of carcinoma is of extremely rare occurrence in the testicle. Its existence has been much disputed and even denied by many pathologists. Thus, Rindfleisch states that soft carcinoma is the only form which affects the testis (*Path. Histol.*, Syd. Soc. transl. vol. ii. p. 194). Mr. Butlin has never met with any case which to his mind has been proved to be scirrhus by microscopical examination (*Sarcoma and Carcinoma*, foot-note, p. 13). The fullest attempt to establish the existence of this variety of carcinoma of the testicle will be found in a paper by M. Nepveu (*Arch. Gén. de Méd.*, 1879, t. i. pp. 129, 314). He considers that, though very rare, scirrhus does occur in the testicle, and that the following are amongst its best marked features. The age at which it appears is more advanced than in the case of encephaloid carcinoma. Its commencement is very obscure and its course extremely slow, the mean duration of eight cases having been six years. The size attained by the growth is usually by no means great, a hen's egg being a maximum estimate, thus contrasting with the colossal bulk attained by many soft cancers of the testicle. The hardness and compactness of the growth are extreme, it creaks on section, and contains very little, if any, juice. Microscopically, the connective-tissue shows abundant, very thick, connective-tissue tracts and trabeculæ, in which are alveoli containing epithelial cells.

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* In a patient of Mr. Cline's, referred to by Sir B. Brodie (*Lond. Med. Gaz.*, vol. xiii. p. 408), a year after castration complete paraplegia made its appearance, the spinal cord having become involved in the course of carcinomatous erosion of t

Sub-varieties of Encephaloid Carcinoma.

(1) **Cystic Carcinoma.**—While the presence of true cysts is more usually associated with sarcoma, they may occur in encephaloid carcinoma. By "true" cysts are meant, not the ones of irregular shape and often ragged walls, which result from softening, fatty degeneration, or hæmorrhage, but those with definite walls and epithelial lining. As in the more malignant forms of cystic disease (*q.v.*) the epithelium may be cylindrical, short columnar, flattened, or spheroidal. The contents may be clear and watery, viscid, or tinted from blood of varying date. The origin of the cysts is still doubtful. According to one view they would, as in "cystic disease," originate in the seminal tubules of the hilum. MM. Monod and Terrillon think that all will be accounted fo by one or either of the following views. According to one which applies especially to cysts with a not very definite wal with but a few cellular elements, and these degenerating, with colloid contents, colloid degeneration would explain their origin The other view is that brought forward by M. Malassez, t explain cystic tumours of the testicle. He believes that the originate in small masses of epithelium appearing in the meshe of the connective tissue. These masses at first solid, later or present a central cavity, which gradually converts them into cyst.

(2) **Reticulated Carcinoma.**—Here, instead of large alveoli the cells, now fewer in number, are arranged in a narrow mesh-

work which recalls some forms of sarcoma or lymphadenoma. The cells however preserve an epithelial type.

(3) **Mixed Carcinoma.**—Kocher states (*loc. supra cit.* S. 352, § 1040) that the fibrous stroma, instead of forming alveoli, occasionally develops into cartilage, adipose tissue and genuine bone. He quotes one case in which, in addition to nodules of carcinoma and closely adjacent to them, were found hard, solid connective-tissue knots, irregular masses of hyaline cartilage, adipose tissue showing spicular crystals, and true bone.

MM. Monod and Terrillon hold that the epidermic globes or pearls, occasionally met with in carcinoma and malignant cystic disease, arise out of the epithelial masses. Many of the cysts present a stratified epithelial lining. In some cases the innermost cells are detached into the cysts and perish; in others they undergo a "horny" transformation, and when detached are collected into the globes which instead of liquid fill the cyst.

(4) **Carcinoma Hæmatodes.**—This term is given to a sub-variety which is distinguished by the extreme richness of its blood-supply.* This brings about rapid growth, perforation of the tunica albuginea, and the malignant "fungus," or hernia, more common in pre-anæsthetic days.

(5) **Melanotic Carcinoma.**—This is not met with primarily in the testicle.

SECTION II.

SARCOMA.

As there is no difference in the malignancy and many other points in the clinical history of the soft carcinomata and sarcomata of the testicle, I shall describe the pathology and morbid anatomy of sarcomata next, and then, to save my space as much as possible, take the clinical history of carcinomata and sarcomata together.

Frequency.—Sarcoma is usually thought to be more frequently met with in the testicle than carcinoma, and this is the view still held by English writers. Kocher, in the second edition of his book, is inclined to look upon carcinoma as the more frequent, as recent microscopical researches conducted by Langhans have shown that doubtful cases, thought at first to be sarcomata, proved to be carcinomata. The sources of difficulty in distinguishing the two growths, arise both in the cells themselves and in the intercellular matrix. They have already been alluded to (pp. 389, 391), and will be referred to later.

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* MM. Monod and Terrillon think that the vessels are characterised by their number and minute size, but also by hosts of *cul-de-sac*-like appendages which they give off from their walls. These appendages, by colloid or mucoid degeneration, open into the alveoli, producing thus a kind of cavernous tissue. On account of this the above writers call this sub-variety "carcinoma érectile, ou té[illegible]ngiectasique."

Varieties.—As elsewhere, sarcomata may be classified in the testicle by the shape of their cells, into round, spindle, and mixed cell sarcoma. Other sub-varieties are mentioned later (p. 394). But a more useful classification may here be made, clinically, of sarcomata into (1) the softer forms, usually round-celled, medullary sarcoma, which is indistinguishable from medullary carcinoma and of the malignancy and treatment of which there can be no doubt, and (2) the firmer and more fleshy forms, in which the process is less rapid, and the diagnosis, especially in the early stages, less easy.

Starting-point of Sarcoma of the Testis.—This is usually placed in the connective tissue of the gland, viz., either that between the tubes, or in that which forms the walls of the tubes themselves. Quite a different theory has been lately put forward, viz., that sarcomata of the testicle arise in the endothelium of the vessels. The following are the points in favour of this view. Langhans (*vide supra*, S. 505, 517), when studying the relation of the cells of sarcomata to the vessels, found a remarkable tendency of the former to group themselves around the vessels as a centre. Monod and Terrillon, in support of this, point out that sarcomata of serous membranes have also been thought to originate in endothelium—*e.g.*, by Waldeyer and Recklinghausen. Another possible endothelial source for these sarcomata exists in the large lymphatic spaces in which the testicle abounds. (Dr. Formad, *Philad. Path. Soc. Trans.*, vol. xii. p. 222).

In what Part of the Organ does the Sarcoma Originate?—This point is not positively settled, owing to the difficulty of obtaining specimens at a sufficiently early date. In a very few early cases which Kocher examined, the sarcoma nodules were found in the hinder part of the testicle, suggesting an origin in the rete. The same observer has had three cases where the swelling started in the epididymis.

Naked-eye Appearances of Sarcoma of the Testicle.—This, like carcinoma, begins as an oval or egg-shaped mass. In soft sarcoma, like carcinoma, the swelling increases rapidly in bulk and weight. In the more fibrous and fleshy sarcomata the gement is slower, and, for some time, uniform in outline. It is absence of any irregularity or bossiness which at first often es it difficult to distinguish these cases from those of chronic itis, especially as a history of a blow and subsequent inflam- on may be present in either case. Later on, irregularity of ne, especially a bossy contour, and unequal consistence at rent spots, may both be met with. On section, it is impossible the unaided eye always to distinguish between a section of dullary sarcoma and encephaloid carcinoma (p. 387). Both the same fawn, buff, or pinkish-grey tints, the same cheesy pultaceous spots, and the same extravasations and ragged ies. In the firmer, more slowly growing sarcomata the sur- is pinkish, and more or less transparent, or greyish-white, -opaque in tint. A fleshy appearance is common in spindle- d sarcomata, and in these the surface is often somewhat lated, and intersected by numerous bands of white fibrous e. In the more rapid sarcomata these intersecting bands are much fainter, and the consistency is much less firm. The fleshy the growth appears to be on section, the more numerous above bands, the more distinct the evidence of the presence rtilage, giving as it were the appearance of sago-grains on the surface, and the more abundant, and better developed are the s, and, finally, the less involved the coverings of the testis, more likely is the specimen to be one of sarcoma.

preading and Generalisation of the Disease.—There is need to add anything to the account given at p. 388 of what pens in the case of carcinoma. Whatever may happen in omata in other parts of the body, affection of the glands is to be ed in all cases of sarcoma of the testicle. This is true of the est and most slowly growing forms, and those in which cartilage cysts are well marked features. Two points alone serve to ially distinguish the two diseases : both refer to their generali- on. In sarcomata, especially the round-celled variety, both s may be affected, a complication which is much more rarely erhaps never—met with in carcinomata. Again, multiple ndary deposits in the skin follow, occasionally, on rapidly ing sarcomata, not carcinomata.

icroscopic Appearance.—The cells, whether round, spindle, nixed, do not call for any special remark either in their acter, their arrangement, or their vessels ; in all these points conform to the type of sarcoma—viz., a growth of connective e origin, composed of elements belonging to that group, and often embryonic. The intercellular substance varies from a most delicate, almost amorphous basis-substance, to a fibrillar meshwork, enclosing the cells in its meshes.*

The more the intercellular substance is suppressed, the more malignant is the growth, and the more it allies itself to medullary sarcoma. In proportion as it is more thoroughly formed, fibrillary, mucous, or granular, so the growth would be called Fibro-Sarcoma, Myxo-Sarcoma, or Granulo-Sarcoma.

It is noteworthy that while the round-celled sarcoma is the one most often met with in the unmixed form, the other forms of sarcoma met with in the testicle are often accompanied by the formation of tissues belonging to the connective tissue group—viz., cartilage, mucous, adipose, and even muscular tissue. If the presence of the above combinations in some sarcomata may be explained by their longer duration and the greater irritation and consequent reactive proliferation of the connective tissue, the absence of these combinations in the round-celled sarcomata may be attributed to their lower degree of development, also to the far more rapid growth, and tendency to secondary deposits, and thus to their shorter duration. Another noteworthy point allied to the above is this, that though a myxoma or chondroma may occur as a simple growth, yet, after a time, the period of which is most uncertain, they often become sarcomatous by a conversion of their connective tissue elements into spindle or round cells.

Sub-varieties of Sarcoma of the Testis.—In addition to the varieties distinguished by the form of their cells, the following merit attention.

1. **Fibro-Sarcoma.**—Here the cells are large and fusiform, and the inter-cellular substance fibrillated, in places eve[illegible] fasciculated. The vessels are proportionately few and any cys[illegible] present scanty in number. The walls of these are very irregul[illegible] and any projections from them into the lumen of the cyst a[illegible] usually firm, solid and warty. The surface of a fibro-sarcoma [illegible] markedly fleshy, and may show well those bands of connecti[illegible] tissue alluded to above (p. 393), which are probably the remai[illegible] of the original intertubular, supporting stroma.

2. **Myxo-Sarcoma.**—Here the section of the growth, thoug[illegible] solid is more elastic and mucous to the touch. Microscopica[illegible] the matrix is glassy, transparent, amorphous, with scatter[illegible]

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* These growths have been called alveolar sarcoma by Billroth, lymphoid [illegible]arcoma by Lücke, and by Birch-Hirschfeld connective-tissue cancer, *par excelle[illegible]*

spindle, oval and stellate cells forming trabeculæ or a network. In other parts the cells become smaller, oval or round and more numerous, and the matrix less amorphous.

3. **Granulo-Sarcoma.**—This is closely allied to the preceding. The matrix is granular and contains round cells of an "indifferent" type.

4. **Cysto-Sarcoma.**—This term has been applied to very different conditions. For the future, what is meant by it should be more carefully defined. Thus, it has been applied to any sarcomata which are rich in cysts, whether these cysts originate —in hæmorrhage, degeneration or softening—*e.g.*, mucoid, or in dilated seminal tubules or lymphatics. Others have looked upon cystic disease and cystic sarcomata as one and the same thing. When I speak of cystic disease of the testicle, I shall show that it is most difficult, if not impossible, to distinguish one form of this—viz., cysto-adenoma—from cystic sarcoma (Fig. 63). By itself this latter term is too indefinite to be of value. If used it should be reserved for the more malignant form of cystic disease (p. 420), though here a more correct term would often be adeno-myxo-chondro-cystoma.

Three other *sub-varieties* have been mentioned by French writers. As one case only of each has been recorded, they will only be alluded to.

5. *Giant-Cell Sarcoma* (Sarcome angioplastique). — MM. Malassez and Monod have described one instance of this sub-variety (*Arch. de Phys. Norm. et Path.*, 1878, t. v. p. 375). It is interesting as proving that these cells arise in sarcomata unconnected with bone. From their belief that the giant cells arise in association with the development of new vessels, MM. Monod and Terrillon have given this sub-variety the second name placed above it.

6. *Gliomatous Sarcoma* (Sarcome Neuroglique).—One case of this kind, occurring in the practice of Prof. Verneuil, has been published by M. Cauchois (*Bull. de la Soc. Anat.*, 1872, t. vii. p. 289). M. Ranvier examined the growth and it was under his authority that it was named as above. Such cases must be quite exceptional.

7. *Melanotic Sarcoma.*—This is always secondary. The only case to the contrary with which I am acquainted, is one very briefly reported by Rydigier (*Ann. des Mal. des Organ. Génit.-urin.*, 1891, vol. ix. p. 359), in which a melanotic sarcoma was removed by castration, and much pigmentation found in the

epithelium of the seminal tubules. It is stated that this latter condition is often found in healthy testicles.

CLINICAL HISTORY.

I shall here consider **Carcinoma** and **Sarcoma** together for the saving of space.

Injury.—While very often the first point in the history is that one side of the scrotum has been noticed, by accident, to be larger than its fellow, blows, squeezes, &c., are fertile exciting causes of malignant disease of the testicle. In some cases their action is direct, and immediate, the testicle swelling at once, and this swelling, which never subsides, passes into that of a gradually developing malignant growth. In other cases, traumatic orchitis is probably an intermediate and slower stage. What the exact explanation of the onset of the malignancy is, we are in ignorance. By some the theory of Cohnheim (p. 385) has been relied upon, it being held that the injury called into activity some fœtal relic or germinal rudiment, which hitherto has been quiescent. Another view is that the patients in such cases are the subjects of some new-growth diathesis—*i.e.*, some special constitutional tendency to the development of new growths. Another very suggestive theory, especially applicable to sarcomata, was brought forward by Mr. Pearce Gould in an interesting paper on "Traumatic Sarcomata of Bone" (*Lancet* vol. ii. 1885, p. 1037). According to this view the origin of traumatic sarcomata is connected with the repair of the injury the growth of the tumour being due to some arrest in the development of the reparative material—white blood cells, lymph, &c.—which at a certain early stage resembles, more or less closely, the tissue of sarcomata.

In other cases the injury has led to increased activity and abnormal cell-changes in some pre-existing epididymo-orchitis or syphilitic orchitis; or falling upon some long-existing and apparently benign growth, changes the character of this altogether. With regard to *irritation—e.g.*, that of repeated gonorrhœa, venereal excesses, &c.—as causes of malignant disease here, nothing for certain is known. But this matter of irritation is, I would here remind my readers, a fact of great clinical importance, to which Prof. Rindfleisch (*Path. Hist.*, Syd. Soc. transl., vol. ii. p. 197) has thus drawn attention: "The glandular and other organs of generation are generally far more prone than other parts to exhibit a transition of simple inflammatory irritations, ulcers, operation wounds, catarrhal overgrowths (hyperplasiæ), into sarcomatous and ultimately into cancerous degenerations. The longer a formative process persists at any point in the generative system—as, *e.g.*, the external os—the more marked does the tendency towards luxuriant proliferation, and finally to carcinosis, become."*

Age.—Here again sufficient attention has not been paid to the diseases included under the head of "Cancer," neither as to the separating carcinoma from sarcoma, nor to the fact that many other diseases of the testicle—*e.g.*, fibro-cystoma, enchondroma—not included under the above, are really malignant.

The statistics given on this head by Ludlow and others must be accepted with this precaution, that they only refer to the more rapidly growing, and therefore to the most malignant, "cancers" of the testicle.

With regard to these, whether carcinomata or sarcomata, one fact is certain, and that is, that these forms occur at an earlier period of life than is the case with other malignant growths. Most of the cases are met with in the years which form or come close to the third and fourth decades of life—*i.e.*, from twenty-five to forty-five.

To speak more exactly of carcinoma and sarcoma separately, carcinoma is most common in the earlier years of adult life—*i.e.*, from thirty to forty-five. It is rare but not unknown after sixty, and practically unknown in infancy.† Mr. Butlin (*Sarcoma and Carcinoma*, p. 22) writes as follows on this head: "I imagine before the age of ten, two causes concur to render carcinoma rare—first, the little liability to cancerous degeneration of any part at so early an age; second, the inactive condition of the epithelium of the testis before the age of puberty."

With regard to sarcoma, the case is somewhat different. Here two periods of life seem specially liable to the round cell variety—viz., childhood, before ten, and the period of manhood between twenty-five and forty, this last being much the same period as that in which the testicle is most liable to carcinoma. The same dates apply to the spindle-celled sarcomata, only one patient being over forty (Butlin). Prof. Kocher's statistics do not agree with the above. Out of 9 "indubitable cases of sarcoma," only 2 occurred between twenty and thirty, and 3 at the age of thirty-six; the remainder were over forty, 1 being even seventy.

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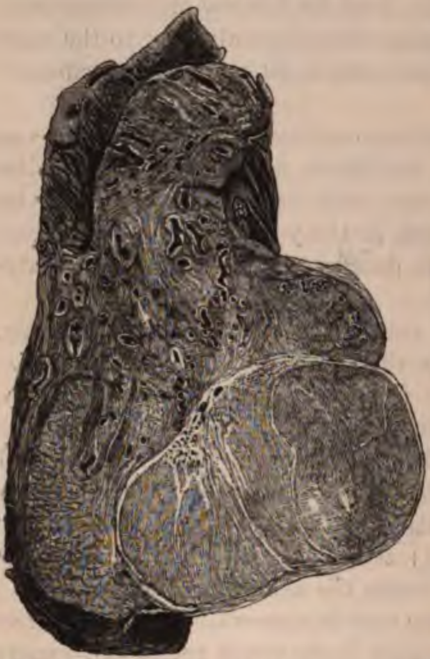
* Spec. 4240 Hunt. Mus., is an instance of irritation acting in a different way—viz., sarcoma attacking a retained testis (p. 65), which has descended late. The gland is affected with soft sarcoma, the cord being also extensively invaded. The patient was aged forty, his right testicle had remained in the canal until two years before his death. Shortly after its descent it enlarged and became painful. A few months later this occurred again. A third time after exercise the testis enlarged, and now permanently, and the patient died in about three months with extensive malignant disease of the lumbar glands.

† Mr. Butlin mentions one case, a child of two, whose testicle was removed after an enlargement of three months, as possibly an instance of carcinoma.

The occurrence of both forms of sarcoma in early childhood is of interest, and somewhat puzzling. It would seem to put traumatism out of court here as a cause, considering how minute is an infant's testicle, and how protected these patients are from every kind of injury. Cohnheim's theory may perhaps explain these cases, but if so, it is strange that it is fœtal connective tissue, alone, which is lit up into activity.

FIG. 57.



Round-celled sarcoma of epididymis, testicle, and lower part of cord. The epididymis is greatly thickened and enlarged by new growth, which seem to have spread into the testicle by continuity. The patient, a gentleman, aged fifty-eight, had only noticed the swelling three months before it was removed. (No. 2797F, St. Bart. Hosp. Mus.)

Symptoms and Course.—To both the soft forms of cancer, whether encephaloid carcinoma or medullary sarcoma, the same account may apply. The development takes place rapidly, a considerable increase being noticed in two or three months. Thus, it comes about that, as pain is absent, there is nothing to arouse the patient's suspicions save the increasing enlargement of his testicle; this, for different reasons, he does not mention, and so in a few months mischief is established which has got beyond all chance of real, permanent cure. As instances of the bulk which may be attained, Santesson gives a case in which, in a child of one year, the testicle was, within one month, as large as a hen's egg;

in a patient of Socin's, aged twenty-three, the growth within six months was as large as an adult head.*

As long as the tunica albuginea, though stretched, remains unperforated,† the swelling retains the shape of a normal testicle enlarged, thus it is for some time of ovoid shape. This retention of a normal outline, which recalls, from the absence of bosses, different forms of epididymo-orchitis, is responsible for much of the delay on the part of medical men in taking a grave view of the case, and in recommending castration which might be permanently successful at this early stage. As soon as the tunica albuginea is perforated bosses and nodular projections of varying consistence make the surface and outline of the swelling irregular. Other causes of irregularities in the outline may also be due to the fact that the epididymis is attacked as well, but not yet blended with the general swelling.

The consistence of the swelling may be misleading. Sometimes it is so soft as to be mistaken for a collection of fluid in the tunica vaginalis.‡ While a certain amount of hydrocele is very common in the early stage of malignant disease, the growth beneath, the cause of the effusion, can always be felt by careful examination through the layer of fluid. Any fluid present may be ordinary hydrocele fluid, or blood-stained, or pure blood.§ The first tends to disappear as the case progresses. Quite a different point with regard to consistency has been brought forward by MM. Monod and Terrillon. Having been fortunate enough to be consulted by patients in quite an early stage of the malignant disease, they were able to make out that the consistence had not yet become uniform over the swelling, a limited induration being detected at one part, the starting-point of the disease. As a rule the growth, firmer at first, becomes softer in these rapidly growing cases, some parts more than others having a pulpy, elastic, or even, as I have said above, a fluctuating feel, tempting the thrust of a trocar. The swelling is not commonly very tender or painful. If there is pain in the part it is dull and aching, not acute and lancinating. The sensation of a dragging weight in the groin and loin is commonly present when the growth has attained any size, and when its progress is very rapid neuralgic pains may be felt in the same parts, or down the thigh. Both these forms of distress are increased when the patient gets about, but, as pointed out by MM. Monod and Terrillon, the pains are not removed by rest. By the time the patient comes for relief, pressure fails to detect testicular sensation at any part. The swelling, when poised in the hand, feels markedly heavy, but the value of this in diagnosis has been shown to be slight (p. 120).

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* This forms the "testicule du taureau" of French writers, of which MM. Monod and Terrillon figure an excellent example, p. 607.

† According to Prof. Kocher, thickening of the tunica albuginea is common in carcinoma, rare in soft sarcoma.

‡ The more delusive the fluctuation the more certain may one be that soft malignant growth exists (Kocher).

§ The occasional presence of hæmatocele due to malignant growth of the testicle is spoken of at pp. 233, 404.

The progress of these soft forms of malignant disease is usually steady and continuous, especially in young patients, whether infants or those in early manhood. Much more rarely periods of apparent quiescence are noticed, or an actual but very brief diminution in size may be brought about by the absorption of the fluid effused during the earlier stages into the tunica vaginalis. But any hopes thus raised will be soon dispelled by the rapid increase of the disease.

The coverings of the testis become surprisingly stretched before the pressure of the quickly increasing growth, so that although the tumour may attain to a huge size, they very rarely give way. Even when the tunica albuginea has yielded the scrotum expands for a while. It may then become adherent to the growth and ulcerate, and the true fungus hæmatodes appear growing rapidly with a sloughy surface, which bleeds readily. But, nowadays, before there is time for this to have taken place, the testicle will have been removed.

The cord, free at first, with a natural vas deferens, becomes thick and full from enlargement of its vessels* and the overloading of these with blood. Later on it may be rendered thick and unusually firm by the deposit, but this is by no means constant. Enlargement of the iliac glands may be present though no deposits can be made out in the cord. It is the enlargement of the cord, due to the above-mentioned vascular changes, which is constantly present and which it is important to detect at once, by comparison with the other side.

As the swelling progresses, the iliac and lumbar glands become involved, and may be made out by careful palpation along the brim of the pelvis, and on either side of the vertebral column.

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* Curling speaks of a spermatic artery as large as a radial. Kocher refers to one in the Freiburg collection which equalled one of the tibial arteries.

The patient now complains of a feeling of tension or oppression, and the pains already mentioned in the groin and loin and back become a more marked and constant symptom. Occasionally they are present in paroxysms, to use the patient's own words, "doubling him up." Another sign that the disease has reached an advanced stage is seen in the interference with the venous circulation brought about by the masses of new growth. The veins of the scrotum which for some time have been unduly distinct, enlarge still further to carry on the embarrassed circulation. The lower extremities may become œdematous from pressure on the cava, while ascites may appear either from similar interference with the vena portæ, or from cancerous peritonitis. Constant cough, and bloodstained expectoration may point to secondary deposits in the lungs, while similar deposits in the mediastinal glands may bring about pleuritic effusion.

It is not till the mischief has thus become diffuse that the general health suffers, and the so-called "cancerous cachexia" makes its appearance. It cannot be too strongly insisted upon that, up to the later stages of the disease, albeit "cancer," the patients are often healthy-looking and well nourished, and even florid and robust.

It is very rare for the inguinal [*] glands to be affected, unless the scrotal skin is involved, which, nowadays, is unusual.

The closing stage of the disease is always a very sad one. Pain and tenderness of the abdomen increase, the appetite fails utterly, nausea and vomiting set in, the face becomes wan and pinched, the skin somewhat jaundiced, while the rapid emaciation of the parts above the disease causes a painful contrast with the swollen and œdematous lower extremities; the pulse becomes increasingly thready and rapid, hiccough is often present before the closing of the scene, and so the patient sinks.

So far I have spoken of the symptoms of the more rapid growths—viz., encephaloid carcinoma or medullary sarcoma.[†]

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[*] I think it is scarcely correct to imply, as Kocher does, that involvement of the inguinal glands can only take place when the disease has reached the scrotum. In epithelioma of the uterus (and I suppose the same might take place in cancer of the testicle) I have seen the superficial groin glands involved, though the external genitals were quite sound. This may be brought about either by a reversal of the ordinary lymph-current between superficial and deep glands, or by direct extension of the disease, step by step, from the latter to the former.

[†] To the chief symptoms of that very rare malignant disease, scirrhus, I have already referred, p. 390.

It remains to refer to the slower growing sarcomata, as the symptoms here are, at first, less well marked, and there is thus a danger that the disease be taken for a more innocent one, and perhaps for syphilitic orchitis, while all the time the disease, though slowly growing, is not less surely getting beyond the reach of any permanent cure by castration. The rate of growth often takes place slowly for several months, the disease at the end of a year forming an ovoid swelling, smooth, without bosses, and still of moderate size—*i.e.*, that of a turkey's or goose's egg. But here there is always the risk, almost the probability that after a period of varying length, the increase will become, it may be suddenly and unexpectedly, very rapid. The consistence, too, for long remains uniform, though, even in a swelling which appears firm and fleshy all over, there are usually spots to be made out where an elasticity pointing to softening is most suspicious.

Diagnosis.—This is, at times, in the more rapidly progressing new growths very easy; at others, especially in the early stages of the more slowly growing sarcomata, it is notoriously a matter of the greatest difficulty, and that too at a time when a prompt decision is of the utmost importance. Again, it will be seen below that of the diseases which may simulate malignant growth, some—*e.g.*, tubercle—may be, at first sight, quite unsuspected.

I propose first to consider the individual diseases which may require to be distinguished, and then to consider the diagnostic points more generally.

Sarcoma and Carcinoma.—Between the soft and rapidly growing forms of these it is usually quite impossible to distinguish, until the microscope can be used, and even then, as already stated, it may be difficult, if not impossible, to decide between the two. The age of the patient, as when malignant growth presents itself in infancy, may be decisive, and the fact that the epididymis is earlier attacked in sarcoma may have a certain, though very temporary, value. Later on, it may be worth while to remember that the cord is more quickly enlarged in carcinoma which sooner involves the lymphatics. According to Kocher carcinoma more rapidly involves the scrotal tunics and fungates. Finally, sarcoma alone may involve both testicles.

Orchitis.—Here we have to deal with the more slowly growing forms of sarcomata. In both an injury may be the starting-point. In both a history of syphilis may be present. The chief points to attend to are the following. Orchitis, especially the syphilitic form, is more chronic and indolent. Testicular sensation must be remembered with caution. In some cases of syphilitic orchitis it is very quickly lost. But usually in orchitis, save of the very densest and cicatricial forms, the presence of the testicle will be more easily and longer made out than in new growths. While, as already stated, slowly growing sarcomata may preserve in their earlier stages the oval shape, the smoothness and uniform consistence of an inflamed testicle, yet if the case be frequently seen at short intervals—and it is needless to say how much depends upon this which is the way to success in all doubtful cases—the smoothness [*] and the consistence will steadily undergo suspicious changes.

In orchitis the epididymis can be more easily distinguished, the cord, though sometimes a little thickened, does not give the feel of enlarged vessels or the solid enlargement of growth. Finally, there is the result of treatment—viz., adequate doses (ʒjss–ʒij) of liq. hydrarg. perch. with potassium iodide, and above all, well applied Leslie's strapping. The diagnosis of syphilitic disease of the testicle has been fully given at p. 317.

Tubercular Disease.—While the characters of this—viz., its attacking the epididymis, its tendency to caseation and suppuration, its small size, &c.—are usually quite distinctive, cases of tubercular disease are occasionally met with which cause a suspicion in the surgeon's mind that he may be dealing with malignant disease.

Such anomalous cases are the following. The testicle rather than the epididymis is affected or the two are fused together, the history is rapid and perhaps dates to a blow. The tubercular disease here has little tendency to caseation, but consisting of hard, uniform fibrous tissue, with "fibrous granulations," not prone, like the ordinary variety, to caseate, forms an oval, smooth, hardish swelling the size of a pear or a large hen's egg, thus recalling the early stage of some carcinomata.[†]

If in such cases the cord is not enlarged, the scrotal tunics not adherent, if rectal examination finds no deposit in the prostate or vesiculæ, and if, as may happen, the patient not only has no tubercular history, but presents the appearance of vigorous health, a differential diagnosis may be impossible.* Such cases are, however, extremely rare, and, after all, any surgeon, who after careful examination has made a mistake, may be comforted by feeling that the same treatment is indicated in each case.

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[*] The multiple nodules and knots which may be present in a gummatous testis are not likely to be confused with the one or two larger and more lowly-rising bosses which bespeak malignancy.

[†] In a case of Mr. Walsham's (*Brit. Med. Journ.*, 1884, vol. i. p. 855), in which tubercular disease simulated sarcoma, a section through the uniformly enlarged body of the testicle, showed it to consist of a hard, grey, uniform, tough substance, traversed by transverse rows of bead-like masses of yellow caseous material in which were interspersed drops of pus. The above most interesting appearance proved the case to be tubercular, and at the same time explained its anomalous points.

Hæmatocele.—It is with this affection that malignant disease may be most easily confused. The indistinct fluctuation which accompanies the softening of a growth, coupled perhaps with the presence of fluid in the cavity of the tunica vaginalis causes a deceptive resemblance to a hæmatocele (p. 235). It is a mistake likely to be made if an opinion is given without watching the case for a short time, and if it be forgotten that hæmatocele usually dates to some injury, or to a pre-existing hydrocele. The following case (Kocher) shows how even an authority in these matters may be deceived:

"I was consulted October 1871 by a gentleman aged fifty for an enlargement of the right testicle which had existed for three weeks, with the sensation of dragging in the groin. The diagnosis of carcinoma or sarcoma of the epididymis was made, after a puncture which gave vent to a little dark yellow fluid, and enabled me to feel a considerably enlarged firm epididymis encircling the normal testis. There had been no preceding affection of the genito-urinary organs; the patient was otherwise quite healthy. A sister had died of carcinoma mammæ. Castration was indicated, but it was decided to make an exploratory incision to avoid any possible mistake. This step, November 11, 1871, revealed a very important thickening of the tunica vaginalis, which resembled a stiff rind. Its inner surface, as well as the outer one of the testis, was covered with a vermilion velvety false membrane. The epididymis was thickened, the testis somewhat large but normal. I accordingly contented myself with excision of the tunica vaginalis. Healing followed without interruption in four weeks. Microscopic examination of the tunica vaginalis showed inflammatory changes and extravasations of blood.† From this time onwards, week by week, it was evident that the tail of the epididymis was enlarging. Castration was therefore performed in the beginning of January 1872. At this time the general health was completely undisturbed. The examination showed an exquisite specimen of sarcoma of the tail of the epididymis; the testicle was normal. Soon after the healing of the wound, which was uninterrupted, neuralgic pains were felt in the peronæal nerve, and later in both ulnars. Occasionally this pain was of the nature of epileptiform seizures. Finally, at various places, especially the face and scalp, very vascular sarcomata appeared as dark red boil-like masses. At the same time (beginning of April) a pneumonia, with bloodstained sputum, made its appearance. Death took place in May 1872. The necropsy, which was incomplete, revealed secondary glandular swellings and deposits in the lungs and liver. Clearly this was a case of acute sarcosis, sending emboli to the skin, lungs and nerve-centres."

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* Mr. Butlin publishes two anomalous cases of tubercular disease of the testicle resembling malignant disease (*Med. Times and Gaz.*, 1883, vol. i. p. 808). He considers perfect smoothness, equal consistence, and, above all, the absence of elasticity, as most valuable in deciding against malignant disease.

† Owing to the greater frequency with which the epididymis is attacked by sarcoma, Kocher holds that hæmatocele, or, as he calls it, peri-orchitis

Hydroceles.—The cases I have given at p. 122, in one of which the experienced Dupuytren was mistaken, and removed an old hydrocele for malignant disease, show how closely, in long-standing hydrocles, a hard, irregular surface, want of translucency and obscureness of fluctuation, owing to the fibro-cartilaginous nature of the walls and the thick contents, may simulate the more slowly growing forms of malignant disease of the testis.

The following are the points on which most reliance may be placed. Continuous, and often quickly progressing solid enlargement of the testicle or epididymis without inflammation. Sometimes this progress is much slower; occasionally it may be seem to be in abeyance, but careful watching with frequent examinations (and these are the key to obscure cases) will show that the enlargement is progressing in spite of treatment. Failure of well directed treatment:—where the swelling is small, still oval in shape, and smooth and firm in outline, a brief trial of mercury or potassium iodide may be made, combined with carefully applied Leslie's strapping, but where in a week there is no result, or where the case is of longer duration, and delay will very likely be fatal, an exploratory incision with antiseptic precautions, followed, if need be, by immediate castration, will be the wiser

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hæmorrhagica, will be more frequently met with in sarcoma than carcinoma. On this poi it I would refer my readers to page 98 of this work.

course.* Consistence :—this is rarely for long the same all over the swelling. Even if a firm slow growth seem uniform and recall orchitis, a careful examination will usually find one or two spots which are more *elastic* than the rest. Usually the softening at places where cystic or degenerative changes are taking place is well-marked. I may repeat from p. 405, that it may require somewhat prolonged watching to detect one or two at first lowly-rising projections or bosses which foretell that the tunica albuginea is becoming thinned at this spot. Of enlargement of the cord,† fulness of the scrotal veins, adhesion of the scrotal tunics, increasing aches and painfulness, I say nothing, as they are evidence that the disease is entering into a later stage.

An exploratory incision is to be preferred to the use of a trocar, as being more certain to give information.

A trocar may enter a solid part or withdraw some scanty mucoid fluid. Sometimes the amount of blood which flows through the cannula of a trocar thrust into a testicle, the subject of rapidly growing malignant disease, is so great as to lead to the supposition that it must be a hæmatocele. In such cases, however, the diminution of the swelling is not so proportionate to the flow of blood as it would be in hæmatocele. Furthermore, the blood is usually bright, not dark and altered as in hæmatoceles. This subject has been alluded to at p. 236.

Prognosis.—Treatment.—It will be seen that the prognosis is always grave, extremely so in the softer and more rapid growths. Kocher goes so far as to say with regard to these that no case of really permanent cure of encephaloid carcinoma is known. In medullary sarcomata, especially in children, the prognosis is almost as gloomy. But while the above opinion is only too true of the majority of cases, a sufficient number have been recorded to show the benefit which may follow on castration, even in the soft forms of sarcomata. Mr. Meade, of Bradford, removed in 1846, the testicle of a patient, aged forty, for a swelling which had lasted about nine months (*Lond. Med. Gaz.*, vol. xliv. p. 702). Nine years later, the patient remained free from any return of the disease. In the Museum of St. George's Hospital is a speceimen of a testicle converted into a mass of soft malignant growths, with large caseating patches, which Mr. Cæsar Hawkins removed from a patient aged forty-five, the enlargement having lasted two years. Twelve years later this patient was alive, and in good health. In the *Med. Times and Gaz.*, 1886, vol. ii. p. 287, a case of Mr. Cock's is mentioned in which a patient remained in good health for six years after castration for "medullary cancer," being then lost sight of in consequence of his emigration to Australia. While these cases are most encouraging, I fear they are exceptional. It will be noticed that in one a swelling had lasted nine months, and in another two years. If it be thought that such cases show that no limit can be fixed beyond which castration must be useless, the following must be remembered. First, it is possible that the earlier enlargement was, for some time at least, inflammatory. Secondly, as a rule in the softer sarcomata, enlargement of the lumbar glands will be present by the end of the first year of the growth, often earlier.

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* I may warn my younger readers of the temporary improvement which potassium iodide sometimes seems to bring about even in malignant swellings.

† I quite agree with Mr. Butlin (*loc. supra cit.*) that *early* enlargement of the cord is met with in inflammatory conditions of the testicle, and is, here, a contra-indication to malignant disease.

Kocher from his statistics found that in ten out of fifteen cases glandular enlargement could be detected within six to eighteen months of the appearance of the scrotal swelling. Statistics on glandular enlargement are of course fallacious. The glands will be involved before they can be felt.

As a rule, the retro-peritoneal glands and viscera will be involved by extension and secondary deposits within six months of the time of castration. And this result is the more disappointing because the testicle, a free, floating organ, and one placed independently in a fibrous capsule, appears to be remarkably favourably placed for the radical removal of malignant disease. The intimate association of the organ with the lymphatic system, both within itself and with those within the abdomen, and the facility with which these are early implicated, handicaps us terribly here.

But if, as happens most frequently, the disease recurs elsewhere after castration, a useful life may yet be prolonged, the patient, rid of a wearisome encumbrance, is made more comfortable, and towards the close, death from internal deposits of malignant disease is not accompanied with the same distress both to the patient and those around him as when the disease is situated externally. In proof of the temporary benefit of castration, Mr. Curling (*loc. supra cit.*, p. 244) relates the case of an eminent barrister, who, for two years and a half after the removal of a testicle for soft cancer, was able to continue the practice of his profession to the great advantage of his family, death ultimately taking place from extension to the lumbar glands.

SECTION III.

LYMPHADENOMA.

Two views have been held here. By most writers this has been looked upon as **a variety of small round-celled sarcoma**, a view taken by Birch-Hirschfeld and Kocher. Certain French writers—*e.g.*, M. Malassez (*Bull. Soc. Anat.*, 1877, t. ii. p. 176) and MM. Monod and Terrillon (*loc. supra cit.* and *Arch. Gén. de Méd.*, 1879, t. iv. pp. 34 and 325)—have insisted that there is sufficient evidence to show that **a new growth of lymphatic tissue formation** does, though rarely, occur in the testicle, thus justifying the above separate title. While the cases are too few for us to be certain as to the conclusions drawn from them, the following are **the points** which the above writers consider **the most important.** On section of the growth, the surface, usually uniform, shows very often a distinctly lobulated arrangement, the lobules here recalling the natural structure of the organ, instead of being irregularly scattered about as in cancer or sarcoma. Thus, they spread outwards, starting from the corpus Highmorianum, as if the disease had invaded at the same time, though to an unequal degree, the different lobules, while for a time it spared the connective-tissue septa running outwards towards the tunica albuginea. Another point which causes the section to suggest that of a simply hypertrophied testis is the colour, which is usually either a rosy grey, or absolutely the buff tint of the natural organ. But natural as may be the tint, the existence of a morbid change is shown by the fragility of the tubules, which, when picked up with the forceps, break off instead of unravelling. Hæmorrhages and caseous degeneration are alike rare. The epididymis can usually be found, though it may be atrophied by the growth which is developed from the testicle itself.

The chief feature in **the microscopical structure** of lymphadenoma is the presence of a reticulum similar to that in lymphatic glands, and enclosing in its meshes lymphatic cells. It is probable that the appearance of the reticulum corresponds to a somewhat later stage of the growth, the first stage being an infiltration of lymphatic cells into the parenchyma of the gland. Thus, in recent cases there may be no evidence of a reticulum. Where the appearance of this characteristic structure is distinct, the seminal tubules appear not only surrounded by the reticulum but actually invaded by it with their walls thickened by lymphoid cells. Where the reticular tissue is less marked, the field is simply infiltrated with lymphoid cells, and the seminal tubules are now merely separated from each other, but their walls not invaded.

As far as the clinical history of the growth goes, there is little, if anything, to distinguish it from many other new growths of the testicle. The period which the growth may take to attain a size sufficient to call for treatment may vary from two months to eight years. The condition of the epididymis should always be examined into, but it by no means follows that because it is not attacked it can be made out at the bedside (*vide supra*). MM. Monod and Terrillon draw attention to the two following points as useful in the diagnosis. Contrary to what usually occurs with growth of the testicle lymphadenoma often attacks both testicles. This occurred in four out of six cases. Sometimes the two glands are attacked at the same time, and almost to the same extent; more often there is an interval, and the disease on one side is more advanced than on the other. The same writers draw attention to another point which was noticed in two cases, and that is, the appearance of soft, subcutaneous secondary deposits in the skin, occurring far away from the original growth, and at first quite indolent, and without any character of malignancy.

Prognosis and Treatment.—The former is very grave; castration should be performed as early as possible.

SECTION IV.

ENCHONDROMA.

Two forms of this disease must be remembered. **One** in which it occurs alone, without cysts or sarcomatous material; **the other** in which it occurs in combination with the above. To the first-mentioned group alone should the term enchondroma be applied. Such cases are rarely met with. M. Dauvé in an excellent monograph (*Bull. de la Soc. de Chir.*, 1861, t. ii. p. 160) collected twenty-eight cases. In only ten of these did cartilage form the chief element of the tumour; in eighteen it was combined with other growths—viz., in six with cystic disease, in ten with encephaloid, and twice with tubercular disease.* The frequency of enchondroma combined with other tissues is shown by some statistics of Kocher. In twelve cases of cystic disease cartilage was found eight times, in seven out of thirty-seven cases of carcinoma, but only twice in forty-one cases of sarcoma. That cartilage should be thus frequently present (almost one in five) in carcinoma, and so exceptionally met with in sarcoma, is contrary to what is usually held by English pathologists.

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* Kocher holds that in both these cases, tubercular disease has been confused with medullary cancer.

A. Pure Uncombined Enchondroma.

Morbid Anatomy. Naked-eye Appearances.—Owing to the long time which this new growth remains limited by the tunica albuginea the ovoid shape is also long maintained. At first, while in its earlier stages, it remains limited to the centre of the testicle and of about the size of a walnut; later on, when it is much increased in size, it is very hard, devoid of elasticity, and its surface may begin to show bosses or a lobulated outline. On section the tunica albuginea is usually entire and thinned by the pressure of the growth. The tunica vaginalis does not contain fluid, but is usually extensively obliterated by an adhesive peri-orchitis.

Beneath the tunica albuginea, spread over the surface of the growth is a thin layer of testicle tissue, representing the expanded gland as in Fig. 60. The growth itself consists of readily recognised cartilage, usually hyaline; occasionally its matrix is fibrous. The most common arrangement is in sago-grain-like nodules (Fig. 58), which grouped together form one or more masses, milky, bluish white, or yellowish in colour, the last being the case when fatty or calcareous degeneration is present. The groups of nodules are separated from each other by septa of fibrous tissue carrying blood-vessels. In other cases the cartilage is arranged not in nodules of sago-grain aspect, but in cylinders which occupy cystic or tubular spaces in which rods of cartilage lie apparently free. The above spaces are usually dilated lymphatics, more rarely blood-vessels.

The cartilage as above described, whether in nodules or cylinders, is firm, resistant, but sometimes patches of much softer tissue can be detected, which can only be recognised as cartilage by the aid of the microscope. Other foci of softening are due to mucoid degeneration; from this may arise cystic spaces, containing mucoid or a yellowish fluid, rich in fatty, degenerated cartilage cells. A different variety of cyst is also met with, possessing a lining of epithelium, and containing a serous fluid, albuminous, and often sticky. These are analogous to the cysts in cystic disease, but how far they originate in dilated seminal tubules or lymphatics is uncertain. Other forms of degeneration, calcification, and even of ossification, are occasionally present.

The epididymis remains recognisable longer than is the case in the more rapid growths, in fact, as long as the enchondroma has not got beyond the limits of the tunica albuginea. In the more quickly growing forms of enchondroma it is sooner involved, and merged with the general swelling.

The cord is usually intact in the pure uncombined variety of enchondroma. But Sir James Paget's case, given below, is an excellent instance of how this may become involved, and also shows that secondary deposits may be expected.

Starting-point of the Growth.—Kocher considers that here, as in cystic disease, the rete is the part first affected, and bases this opinion on the fact that in each of these diseases it is not uncommon to find a thin layer of stretched testicle tissue expanded by the growth (Fig. 60). Other points which support this view are, the integrity of the epididymis and the fact that in the early stages of the disease enchondroma is found as one or more nodules in the centre of the testicle.

Relation of the Growth to the Minute Anatomy of the Testicle.—As already stated, the cartilage is usually of the hyaline variety. The mode of production of a tissue-like cartilage in the soft delicate tissue of the testicle was first satisfactorily explained by Professor Virchow, who showed that the cartilage originated in the interstitial connective tissue.[*] This authority pointed out that the connective tissue is often in a state of irritation of traumatic origin, especially after a contusion, and that thus irritated it later on undergoes conversion into cartilage, this conversion being compared to what takes place in the periosteum after fractures, at the time of the formation of cartilaginous callus. Professor Virchow supports his view by the fact that in sections of an enchondroma of the testicle all the intermediate forms between embryonic connective tissue and true cartilage may be found. Thus, in the centre, is true hyaline cartilage; a little further out the appearance is that of fibro-cartilage, while nearer still to the periphery the characters are those of growing embryonic connective tissue.

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[*] *Die Krankhaften Geschwülste*, Bd. i. Vorl. xvi.; Virchow, *Arch.*, Bd. viii. S. 402, Tab. ix. Fig. 12. For other remarks on the inflammatory starting-point of these growths, the initial stage of irritation and what may be termed the pre-enchondromatous period, W. Busch (*Chirurg. Beobachtungen*, S. 51) may be consulted. See also Virchow, *Char. Annal.*, 1858, Bd. iii.

MM. Monod and Terrillon take a somewhat different view of the origin of the cartilage here. While admitting that it starts in embryonic cells, they hold that these are fœtal relics rather than the results of irritation. According to this hypothesis the embryonic cells which are later developed into the enchondroma, are relics brought down by the testicle from the proto-vertebræ or chorda dorsalis, in contact with which it lay in early days.

It has been shown above (p. 410) that the cartilage in the testicle may occur in nodules or masses made up of small grain-like bodies, or that it may be arranged in cylinders or tubules. The nature of these spaces has been much discussed. According to Professor Quekett, Mr. Curling, and, in later years, Professor Verneuil, they are simply dilated seminal tubules. Billroth, Virchow and Kocher, on the other hand, look upon these spaces as dilated lymphatics, and the same view was taken by Sir J. Paget in his well-known case of rapidly malignant enchondroma of the testicle (*vide infra*). It is probable that in the majority of cases the second view is correct.* But whether these tubes be seminal or lymphatic, the presence of the cartilage is secondary, this tissue having entered by a process of invasion, aided no doubt, in the case of the lymphatics, by the number and size of these naturally present in the testicle, and the origin of the enchondroma in the rete testis, for, as pointed out by Virchow, the growth beginning here, must retard considerably the outflow of the lymph from the testicle, and so favour a dilatation of the lymphatics.

It is readily intelligible how the cartilage, at first highly cellular, and originating in inflamed and irritated connective tissue, may a little later find its way into the lymphatics, which so richly abound in the testicle, a view which seems more probable than that according to which the lymphatics were the starting-point of the cartilaginous growth.

So far I have spoken of the enchondroma proper, or growths in which cartilage is the predominant, or the only, morbid tissue present.

(B) **Mixed Enchondroma.**—A more malignant form is sometimes met with in which the tissue between the masses of cartilage, instead of being simply connective, is sarcomatous. In these cases, though cartilage seems at first sight to form the chief part of the growth, careful examination shows here and there little soft grey or pinkish masses composed of sarcomatous tissue, generally of the spindle-cell variety. It will readily be understood how irritation or injury may bring about formation of embryonic tissue, and thus of sarcomatous growth, and how this complication may account both for periods in which the swelling is noticed to increase rapidly, and also for its recurrence after removal. The accompanying figure represents a specimen in which cartilage, fibrous, and sarcomatous tissue, have occurred together. An excellent instance of chondro-sarcoma was recorded by Mr. Campbell De Morgan (*Path. Soc. Trans.*, vols. xviii. xx. p. 33, plates xi. xii.).

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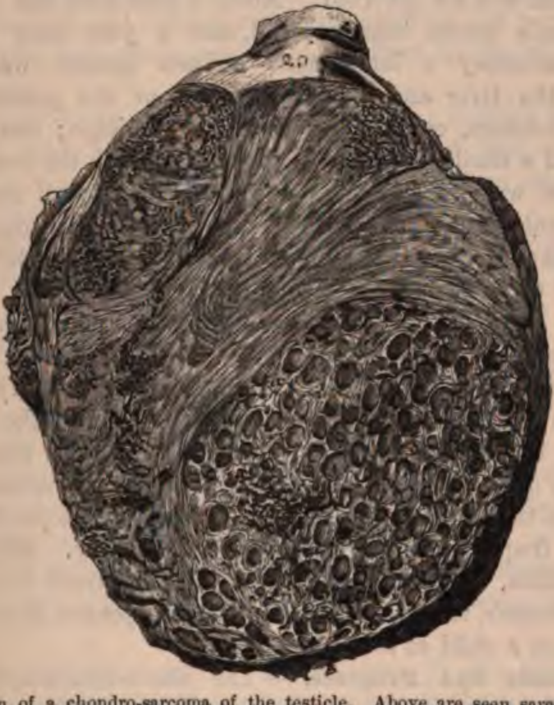
* The fact that the testicle-tissue, if present, is found pushed away towards the periphery of the growth, and the absence of any seminal tube sections in the growth, seem to point strongly against these cylinders being dilated seminal tubules.

FIG. 58.



Section of a chondro-sarcoma of the testicle. Above are seen sarcomatous masses with interlacing bands of fibres. Below a large patch of cartilage is mingled with the softer growth. The growth is closely adherent to the scrotal skin. The patient, aged thirty-five, had first noticed enlargement of his testicle two years before. A gleet of long standing was then present. The opposite testicle was not enlarged, but was very tender when this specimen was removed. Four months after castration the disease reappeared in the inguinal glands. (Spec. 4226, Hunt. Mus.)

A groom, aged thirty-five, squeezed his left testicle against the pommel of a saddle. When, two months after, the bruising and acute swelling had subsided, the testis remained hard and somewhat larger than normal. Six months later, when the testis was removed, cysts were present, some containing liquid and some solid growths. In the connective tissue between the cysts, nodules of cartilage were thickly scattered.

The cord was not involved. About a year after the operation the patient's health began to fail, and a year later he died. At the necropsy a large mass of new growth was found, between the liver and the right groin, at the posterior wall of the abdomen, containing cysts and cartilage; small cystic growths of a similar kind were scattered through the lungs, while the pleura was studded here and there with small firm pink-white nodules. At some points, especially at the edges of the nodules, the cartilage cells could be seen to change their plump forms for those of elongated and oval spindle cells. At other parts the growth consisted almost wholly of spindle and oval cells arranged in regular tracts.

Causation.—It is remarkable how frequently injury is mentioned as a starting-point of enchondromata of the testicle. Whether the injury acts by calling into activity fœtal relics previously quiescent, or by converting more stable structures of the connective-tissue group into embryonic cells, is as yet doubtful. The most frequent age is from twenty-five to forty. MM. Monod and Terrillon, state that two cases have occurred in infants: one, of Weber's, is believed to have been congenital, the other, of Poinsit's, in a child of four.

Symptoms and Progress. — The above-mentioned French writers divide these into three stages. (1) The first, not very well defined, in which the testicle is somewhat enlarged, but without any definite characteristics. The duration of this stage varies from four to six months to two and a half to five years. (2) The second stage. It is now that the patient usually comes under observation. The swelling, the more the cartilage predominates, is oval, of remarkable firmness and hardness, its outline smooth and uniform at first, becoming later irregular with bosses or nodules of lowly elevated outline. The swelling is usually indolent and free from pain, the dragging weight being all that is complained of. (3) In the third stage the growth becomes generalised. While this stage must always be remembered, it is not constant, occurring only in the "mixed" and more malignant chondro-sarcomata, and in a certain number, the proportion being as yet unexplained, of the purer enchondromata. Whether this stage occurs before or after castration has been performed, it shows nothing which has not been already fully noticed at p. 400.

Diagnosis.—It will be gathered from the above account that an enchondroma is one of the growths of the testicle in which it is not easy to make a diagnosis. The age, history of an injury, hardness and indolence of the swelling, the occasionally bossy outline, and the soundness of the cord are the chief points to rely upon.

Cases may occasionally occur, where with a definite history of an injury, and a rapid course with a brief first stage, the possibility of a hæmatocele with thick walls must be remembered. An antiseptic incision will clear up the case.

Prognosis.—Even when the growth seems made up of cartilage alone, it is to be looked upon with the greatest suspicion. On this subject I may quote words written in 1882 (*Syst. of Surg.*, vol. iii. p. 540). "Clinically it is extremely doubtful whether these apparently simple enchondromata of the testis may not at any time become sarcomatous. When the close relations of cartilage to the other tissues of the connective type are considered, and when it is remembered how narrow is the border line between these tissues and sarcomata, especially when, under irritation or inflammation, the former tend to recur to their embryonic forms, it may well be doubted whether a cartilaginous growth of the testicle really deserves the name 'innocent.'"

As showing how surely an enchondroma of the testicle may run a fatal course, though the cartilaginous element may largely predominate, the following well-known case of Sir James Paget's (*Trans. Med.-Chir. Soc.*, vol. xxxviii. p. 250) must always be remembered.

A man, aged thirty-seven, two years before admission, noticed a slight, painless enlargement of the testicle, which perhaps dated to an injury. A year later the testis was severely bruised in a fall. It now gradually enlarged. On admission the swelling was roundly oval, unequal on its surface, lowly tuberous, and perfectly defined. It measured 10½ inches in circumference, was very heavy, in most places almost incompressibly hard, but in some soft and yielding. The scrotum was tightly stretched over it, but not adherent or changed in texture. Above this mass the swelling extended up the cord, which felt very large and firm. On removal of the diseased testicle and the swelling along the cord, the mass that occupied the place of the testis was of nearly oval form, smoothly invested with the tunica albuginea and the thickened and partly adherent tunica vaginalis. It was composed of tortuous, cylindriform and knotted pieces of cartilage, which were closely packed and embedded in tough, filamentous, white, connective tissue. Over parts of this mass a layer of seminal tubules was thinly spread out between it and the tunica albuginea. Above this mass, along the cord, were others, conical, oval or rounded, the upper ones of which resembled a chain of enlarged lymphatic glands, and contained, as they were followed upwards, an increasing amount of soft structure, which on examination was found to be filamentous and densely nucleated. The patient recovered remarkably well from the operation, and left the hospital apparently free from disease. In about three weeks, however, he returned, much more feeble, panting on the least exertion, and scarcely able to walk. Ten days later death took place suddenly, the chief symptoms being referred to the lungs by increasing breathlessness, though the physical signs remained somewhat indefinite. *Post-mortem Examination.*—Two dilated and tortuous lymphatic vessels ran upwards from the scar, being filled with growths similar to those met with below. These became connected above with a swelling resembling a hen's egg, probably a diseased lymphatic gland, which adhered closely to the front of the cava. At this spot a cartilaginous growth projected from one of the lymphatics into the interior of the vein. It was branched like a stunted, leafless shrub, and one or two isolated tuft-like growths of cartilage were attached to the inner coat of the vein close by. The only other evidently diseased parts were the lungs, which were so much enlarged by the formation in them of cartilage masses as to weigh together 11½ lbs. The cartilage either existed in the healthy pulmonary tissue as cylindrical, nearly spherical, lobed masses, easily shelled out, or as small shrub-like growths attached to the lining membrane of the larger branches of the pulmonary artery.

Treatment.—Castration should be performed as early as possible. Not only is it impossible to tell how far the nature of the connective and fibrous tissue between the masses of cartilage is simple or cellular, innocent or sarcomatous, but it must be remembered that an enlarged testicle is especially liable to injury, just as a hydrocele may be converted into a hæmatocele. Now it has been proved that after injury or irritation sarcomatous growth may easily be lighted up in tissues which may up to that time have been simply fibrous, or lowly cellular. And here I may remind my readers of the words of Prof. Rindfleisch quoted above (p. 396).

SECTION V.

FIBROMA.

This form of new growth is extremely rare in the testicle and epididymis, although proliferation of the connective-tissue of the gland plays so large a part in other new growths—viz., cystic disease (cystic fibromata and cystic sarcomata), and in the rarer scirrhus.

In the few recorded cases the exact source of the growth is not always stated with sufficient precision, but two sites of origin are certainly known—viz., the tunica albuginea and the rete testis. The following case (Warrington Haward's, *Path. Soc. Trans.*, vol. xxiii. p. 168) is an instance of the former. A man, aged eighty-one, had noticed gradual enlargement of the right testicle for eight years. It was painless, but heavy, causing dragging along the cord. The right testis was elastic, heavy, and nodulated, some nodules being, however, less hard than others. The cord was not enlarged, the skin was not adherent, nor could any tumour be felt in the abdomen or elsewhere. The growth sprang from the tunica albuginea, the secreting structure remaining unchanged. When cut into, it creaked under the knife, the section exhibiting numerous opaque-white bands arranged in various curves, between which was a greyish homogeneous basis. The microscopic appearances were those of ordinary wavy fibrous tissue, for the most part well developed. The testicle was removed by Mr. Lee.

M. Cruveilhier figures (*Anat. Path.*, t. v. pl. 1, Fig. 3) what appears to be a fibroma arising within the substance of the testicle itself. It closely resembled a fibrous tumour of the uterus, or the tissue of an unimpregnated uterus. The testicle, which was removed by M. Marjolin, was very heavy in comparison with the size, which was twice that of the natural testis. It resisted and creaked under the scalpel. It was composed of contorted and interlaced greyish-white fibres forming lobules, with vessels penetrating their interspaces. M. Cruveilhier could discover none of the natural tissue of the testicle, and he believed that the fibrous tissue was formed at the expense of the cellular tissue which unites the seminal tubes, and that the proper tissue of the gland was atrophied from pressure.*

Kocher (*loc. supra cit.* Fig. 76) figures a specimen of fibroma from the Museum of Zurich, growing from the rete testis into the epididymis, the canals of which are dilated into cystic cavities. The fibroma was as hard as cartilage. The testicle structure did not appear to be wasted. The same authority mentions the existence in the collection at Göttingen of a fibroma which is calcified.†

On account of its rarity the clinical interest of fibroma of the testicle is slight. Slow growth and exceeding hardness are likely to be the most characteristic features. The diseases for which it may be mistaken are long-standing orchitis, old hæmatoceles, and perhaps scirrhus. Castration is the only treatment.

SECTION VI.

MYXOMA.

This is another growth, which, owing to its exceeding rarity, by itself or uncombined, is of little clinical interest. Myxoma almost invariably occurs in combination with other growths of the connective-tissue type—viz., sarcoma, chondroma, or cystic disease.

MM. Monod and Terrillon give three cases of pure myxoma of the testis, one under the care of M. Trélat, brought by M. Bruns before the Anatomical Society of Paris (*Bull. de la Soc. Anat.*, 1878, p. 523). This specimen occurred in a patient, aged seventeen, who for two months had noticed a swelling in the left side of his scrotum, which after a gradual development of six weeks, had suddenly increased greatly in size. The swelling was as large as two fists and fluctuated very distinctly. The diagnosis being that of a hæmatocele which had developed in the course of a hydrocele, a puncture was made which did not draw off any fluid, but set up so much reaction that castration became necessary four days later.

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* M. Péan (*Traité des Tumeurs de l'Abdomen*, p. 449) figures a good instance of fibroma of the testicle, in which the growth seems to have invaded the entire gland.

† I have not included in the above account of fibromata of the testis, a case quoted by Curling, Kocher, and MM. Monod and Terillon. It is one given by Sir J. Paget (*Surg. Path.*, p. 469) under the heading of Fibro-cellular Tumours. The tumour had, in seven years, grown to a measurement of nearly 6 in. by 4. The statement that it was "a typical specimen of fibro-cellular tumour in a very œdematous or anasarcous state" makes it possible that the growth here was a myxoma or a myxo-sarcoma.

A section of the growth showed a whitish mass of quivering tissue, in appearance resembling that of the umbilical cord. Microscopical examination showed that the growth was exclusively made up of myxomatous tissue. The history of this case is only carried on for two months, at which date the patient remained well.

The second case was reported by Breus of Vienna (*Wien. Med. Woch.*, 1878, p. 767). Here the swelling had only been recognised for six weeks. Death occurred, and the growth was found to have penetrated into the veins of the cord, and the cava, nodules, clearly embolic, being also found in the lungs. The third case was reported by Romano (Morgagni, *Dispens.*, 1873, pp. 297, 403). The chief point of interest here is that the growth fungated, a termination which Virchow has shown to sometimes occur with myxomata of the breast.

Course and Symptoms.—There is nothing here to distinguish myxoma of the testicle.

Prognosis and Treatment.—This growth should be looked upon with the greatest suspicion, as allied to the sarcomata, and treated by early castration.

SECTION VII.

MYOMA.

Under this heading **two varieties** of growths have been described, viz., **myomata with smooth fibres** and **myomata in which the muscle is striated.** The former occur in connection with the epididymis or cord, and the muscular fibre here probably points to the origin of these growths from the smooth muscular fibre of the epididymis or vas deferens just as the presence of the same tissue in the tubules of some specimens of "Cystic Disease" probably denotes that the growth began in the coni vasculosi, the tubules of which contain smooth muscular fibre. The two best cases of this very rare growth are those of Rokitansky (Schmidt's *Jahrb.*, 1849, Bd. lxiv. S. 210), and Neumann (Virchow's *Arch.*, 1886, Bd. ciii. S. 497). Here the patient was a child of three and a half; the growth was firmly connected with the testicle, at its lower end. As this corresponded to the attachment of the gubernaculum, Neumann thought that the growth originated in relics of this muscle.*

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* Other cases, such as those of Schuch (*Path. und Ther. d. Pseudoplasmen*,

SECTION VIII.

OSTEOMA.

There are certainly two cases recorded in which true bone-tissue was found in the testicle, though the site of origin of this tissue remains quite unknown, and even the exact relations of it to the testicle are uncertain. One case, that of Schœnborn, was reported by Neumann (*Arch. d. Heilkunde*, 1875, Bd. xvi. S. 92). Here the growth occurred on the left side, was smooth, of bony consistence, and crepitated under strong pressure. The second case was brought by Dr. J. A. P. Price before the Pathological Society (*Trans.*, vol. xxxvi. p. 296). Bony deposits were found in each testis and epididymis in the body of a man aged sixty-four, who died of granular kidneys, cystitis and stricture. Dr. Price points out that an epididymo-orchitis may thus have been the starting-point of the bony deposit.

SECTION IX.

CYSTIC DISEASE.

This too general term has been made to include very different disorders of the testicle. With the more exact pathology of the present day it should be abandoned.

For the sake of convenience **two groups of growths** will be found to be included under and by their more accurate names to replace the term "cystic disease ofthe testicle." They are: (A) **A more innocent group, in which the cysts are the only prominent feature,** their contents and their uniting stroma being usually simple, and uncombined with other tissues. This group represents the "cystoma simplex" of Kocher, the "cystic fibromata" of Mr. Eve. (B) **A group of a more complicated and malignant character.** Here the cyst walls more usually show papillary projections, and the **intercystic stroma** is more complicated, **being often myxomatous, sarcomatous, fibro-myxo-sarcomatous,** or **even carcinomatous.** This would correspond in the main to Mr. Eve's cystic sarcomata.

But it must be remembered that while, for the sake of convenience the above divisions may be made, there is **no sharp and well-defined distinction between the two groups.** Both are

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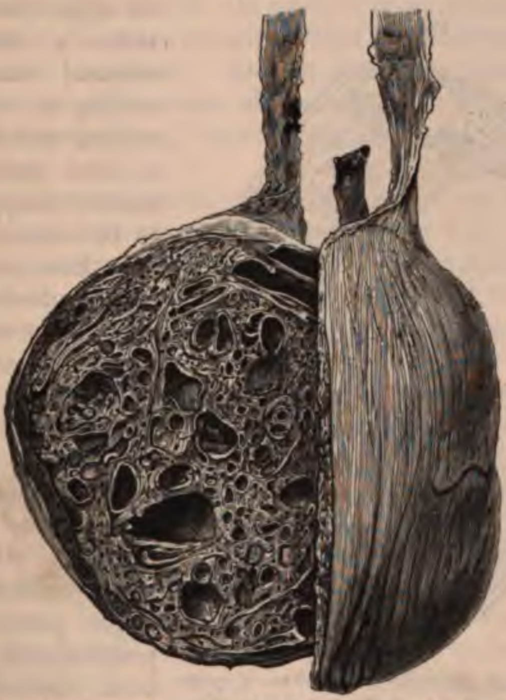
1854, S. 182); Billroth (Virchow, *Arch.*, 1855, Bd. viii. S. 433); Senftleben (Virchow, *Arch.*, 1858, Bd. xv. S. 344); Nepveu (*Mém. de Chir.*, 1880, p. 505), appear to be instances of mixed growths and not pure myomata.

probably varieties of the same form of growth. In the simple cystoma as well as in the cystic sarcoma relapses and metastases may occur. I have merely retained the above division because—(*a*) the structure of the simpler illustrates that of the more complicated variety; (β) clinically there is a most important difference in the rate of growths of the two varieties. There is also much more hope of a permanent cure after castration in one than in the other. As in the other chief growths, I shall consider under the **morbid anatomy and pathology** of these growths (1) the naked-eye appearance, (2) the minute structure, (3) the starting-point of the growth, and (4) its relation to the minute anatomy of the testicle.

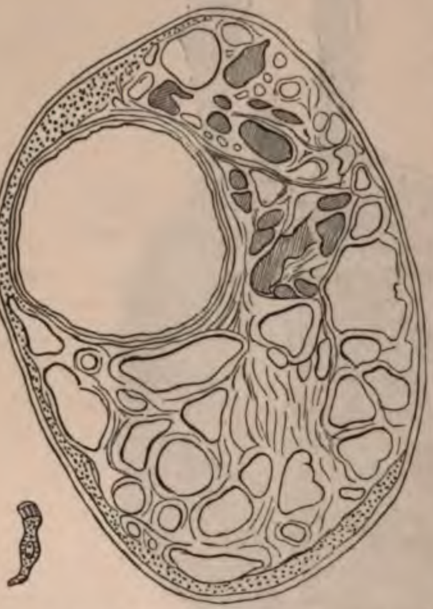
FIG. 59.



A testis much enlarged by cystic disease. Its surface is almost uniformly smooth, only one small tubercle projecting from it under the tunica albuginea. A considerable portion of the natural secreting tissue remains at the upper and anterior part. The growth consists of a mass of cysts, most of which are minute, but some are a third of an inch in diameter. The greater number contained a clear, nearly colourless, slightly albuminous, fluid; some were filled with opaque, soft, curdy matter. The stroma was rich in ill-developed connective-tissue elements, round and spindle cells being thickly scattered throughout it. Cartilage was also abundantly met with. (Spec. 4222, Hunt. Mus.)

(1) The Naked-eye Structure of (A) The more Innocent, or Simpler Cystic Growths.—The growth here, as in all others which have not perforated the tunica albuginea, presents the regular ovoid form, usually uniformly smooth on its surface, or showing, at most, one or two small elevations. The tunica albuginea is usually somewhat thickened; the cavity of the tunica vaginalis is obliterated in great part or altogether, and sometimes its upper part still contains a little dark-coloured serum. On cutting a section the natural structure seems at first sight to have entirely disappeared, and to be replaced by cysts and intercystic tissue. But on further examination some of the tubular tissue can be made out beneath the tunica albuginea, at the upper and anterior part of the swelling, thinly spread out in one or more layers. Occasionally these extend over a larger portion of the periphery, taking a somewhat crescentic shape (Figs. 59, 60), but always occupying the same part of the growth. In more recent cases more than one layer of testicle tissue may be found. The older the case the thinner and more closely adherent to the growth is the layer. The surface of the section is almost exclusively occupied by cysts connected into an elastic mass by the apposition of their walls and by a small quantity of intervening and (apparently fibrous) tissue. The cysts are round or oval, usually not exceeding a quarter or half an inch in diameter. Their interior is smooth and even polished, in the great majority of cases without papillary or other projections. More rarely the epithelial lining forms pro-

FIG. 60.



Section through one of the simpler forms of cystic disease. To the left, the anterior part of the section, normal testicle tissue is seen spread out in a thin layer beneath the tunica albuginea. To the right and above, nodules of cartilage are seen in section. (Kocher.)

jections or outgrowths into the lumen of the cyst. The walls of the cysts are not separable by dissection from the surrounding tissues. Many of them may communicate by tubular spaces, as is shown by fluid which has been injected into one cyst issuing from others at some distance off (Spec. 4220, Hunt. Mus.).

The contents of the cysts vary. Sometimes they are clear and limpid, at others mucous and glairy, colourless, or citron yellow or brownish from altered blood. In some cases an opaque white, soft curdy substance has been present, likened to "softened tubercle" in old museum catalogues. As this shows sometimes a pearly lustre it has secured the name of "atherome perlé," "epitheliome perlé," or "cholesteatoma," from the supposed presence of crystals of cholesterine.

The stroma or intercystic tissue may be scanty or obscurely fibrous, or dense with wavy shining bands (Fig. 61). A varying amount of cartilage arranged in rods or nodules is found embedded in the stroma. Mr. Eve considers that this tissue is nearly always present in the more innocent cystic tumours (Fig. 59).

Minute Structure.—The cysts have a wall of several layers of condensed fibrous tissue. Their epithelial lining shows the greatest variety in shape, size, and arrangement. The commonest form is columnar, long or short; occasionally this is ciliated. In some instances the lining consists of several layers, the outermost or deepest layer being elongated or columnar, then follow several layers of spheroidal cells, which towards the free surface become flat and pavement-like (Eve).* These varieties may all be met with in the same cyst. The pearly substance above mentioned is produced by the collection and pressing together of cells which are detached without being destroyed.

The *minute anatomy of the stroma* shows fibrous tissue, with fasciculi coarsely interlacing or softer, looser, and more wavy. In places patches show myxomatous tissue; in others they are rich in round cells, or show fasciculi of spindle-cells, which may be in process of development into fibrous tissue or perhaps into smooth muscular fibres. But the possibility of a more malignant sarcomatous development must not be lost sight of. The cartilage cells are round or oval, rarely stellate, the matrix often faintly fibrillar. The growth of the cartilage nodules "takes place at the periphery, where there is a thin layer of myxomatous looking tissue, and the manner of transformation of this tissue into cartilage reminds the observer of the mode of formation of fœtal cartilage from embryonic cells, as, for example, in the protovertebræ." Microscopic examination of the layer of remaining displaced and much-stretched testicle tissue, shows seminal canals undergoing atrophy. It is noteworthy, as pointed out by MM. Monod and Terrillon, that it is never possible to find dilated seminal tubes undergoing transformation into cystic cavities. Kocher also allows that the seminal canaliculi never show signs of dilatation or proliferation.

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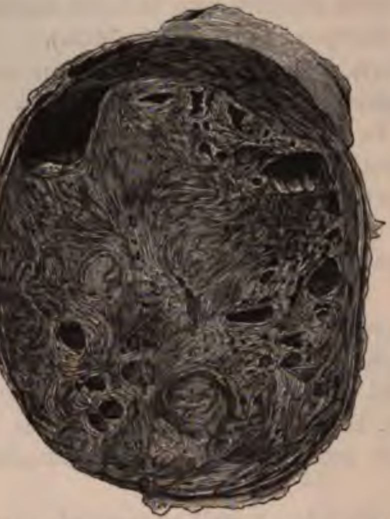
* This observer is of opinion that the occurrence of several layers of flattened epithelium in some of the cysts is due to their having been submitted to pressure; this is rendered probable by the flattened cells being met with in the larger cysts. The columnar epithelium may be caliciform or goblet-shaped from the accumulation of mucus within their protoplasm.

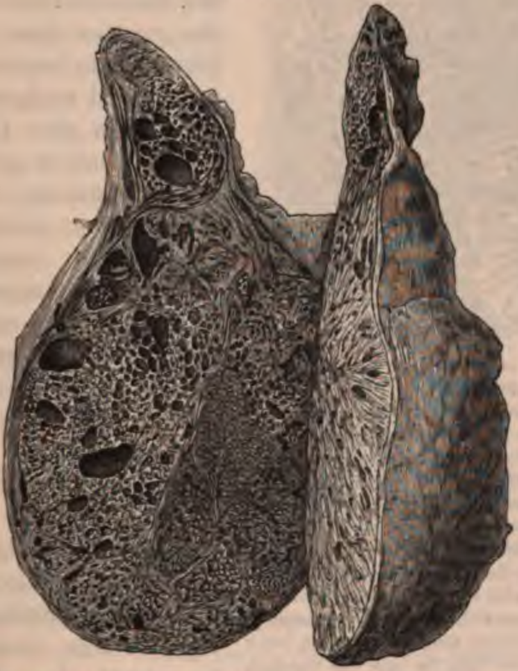
FIG. 61.



A testicle showing "fibro-cystic disease." The mass is composed of very firm, dense, greyish-white substance, intersected by white lines, closely resembling the firmest fibro-muscular growths of the uterus. Numerous cysts are present, in some of which was serum, in some a fluid like serum and pus, in some creamy contents, in others a brown, thick, and grumous fluid. Small nodules of cartilage are thinly scattered through the substance of the growth. The tunica albuginea is much thickened. On its inner surface a thin layer of seminal tubules was found spread out. The patient, aged fifty-eight, believed that the disease had been in progress for twenty years. The testicle remained enlarged after an attack of gonorrhœal inflammation, but no marked increase in size took place till ten years later. From this time the increase has been constant, though slow. Twelve months after the removal there had been no return. (Spec. 2793, St. Barth. Hosp. Mus.) This figure should be compared in its structure and history with Figs. 59 and 62.

(B) The **more complicated and malignant form—cysto-sarcoma.**—Here also, in a large number of cases, an expanded layer of testicle tissue may be found, pushed away towards the upper and front part of the growth. The cysts are not so marked a feature, being less abundant, smaller and less uniformly distributed throughout the section. The greater malignancy of the growth is shown by the fact that in these cases nodules may now be detected projecting through (though still covered by) the tunica albuginea into the cavity of the tunica vaginalis. The cysts here are often proliferous, containing sprouting foliaceous and lobulated, or papillomatous masses, usually sessile, occasionally pedunculated (Fig. 63). Co-existing with these proliferous cysts is a far more complex grouping of the tissues in the stroma. In this, in addition to fibrous or fibrillar tissue, and to myxomatous tissue, round and spindle cells, bundles of spindle cells suggesting smooth muscular fibre, striped muscular fibro-, myxo- or fibro-sarcomatous tissue may all be met with.

FIG. 62.



Testis the seat of the more malignant form of cystic disease, the stroma consisting of round-celled sarcoma tissue. (Spec. 2797C, St. Barth. Hosp. Mus.)

Starting-point in the testicle of (*a*) the cystic fibromata and (*b*) the cystic sarcomata. This is probably for both, as Mr. Curling suggested for the simpler, more cystic forms, in or close to the mediastinum testis. This view is supported by the existence of a layer of expanded testicle-tissue pushed away to the front of the growth,* by the presence of columnar epithelium in the cysts of both forms of growths, and of columnar ciliated epithelium in some, while a few contain smooth muscular fibre which naturally surrounds the coni vasculosi. Cartilage, too, is present in both, though more abundant in the cystic fibromata. Other points in favour of a common origin of both groups are pointed out by Mr. Eve—viz., that certain of the growths show conditions intermediate between the innocent and malignant forms. He thinks that the greater development of cysts in the cystic fibromata is due to their slower growth, which allows more time for this process of dilatation.

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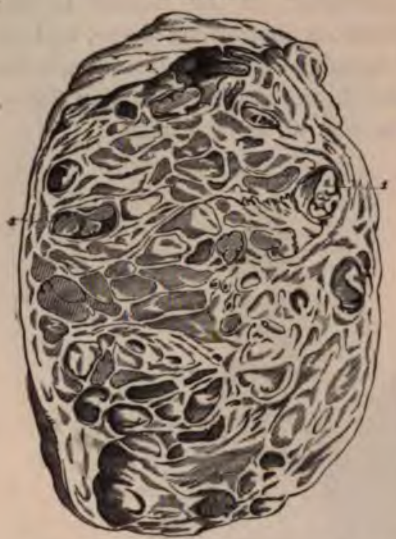
* In a table of forty cases collected by Mr. Eve, a more or less distinct layer of testicle-tissue was met with in twenty-one, at some portion of the surface of the growth. In sixteen cases of cystic sarcomata tabulated in the *Med. Times*

FIG. 63.



A specimen of "malignant cystic disease," or, with greater histological accuracy, an adeno-myxo-sarcoma. Of the numerous round and oval cysts scattered through the section, some are empty and some contain minutely lobulated growths (–1 and 1–) which have arisen from their walls and nearly fill their cavities. These, like the stroma, contain myxomatous, sarcomatous and glandular tissue. The patient was aged thirty-three. The disease was believed to have originated in a blow, to have long existed, and at last to have grown very rapidly. There was no return after the operation, but it is not stated how long the case was watched. (No. 4228, Hunt. Mus.) (Curling.)

It remains to consider the **relation of the growth and of its starting-point to the minute anatomy of the testicle.** Curling, who first showed that the simpler form originated in the mediastinum testis, thought that the cysts were produced by dilatation of the seminal tubules. Against this view may be brought the important objection that it has never been possible to find seminal tubules dilated, or in process of being transformed into cysts. Another objection to this view is that it is insufficient, as it takes no heed of an undoubted new formation of epithelium which is found to be present in these cases. M. Malassez has dwelt on this fact, and has founded on it a totally different theory of the origin of cystic disease of the testicle (*Arch. de Phys. norm. et path.*, 1875, t. ii. p. 122). According to him the origin of the cysts is entirely extra-canalicular.

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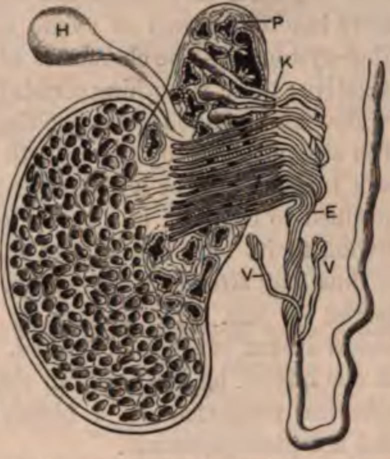
and Gaz., vol. xi. p. 395, the gland structure was spread over the growth in eight, lost in the growth in four, and not described in four.

It takes place in small masses of epithelial cells met with in the lacunæ of the connective tissue; these masses, at first solid, melt down in the centre, forming a cavity, which gradually enlarges, and forms a cyst. From this epithelial origin and the existence of an epithelial lining, M. Malassez has placed cystic disease of the testicle under the heading of epitheliomata.

Other observers who have also accepted the view that an actual new formation of epithelium takes place, have explained its origin and its relation to the cystic disease differently. Thus, Kocher believes that the new epithelium takes its origin in the seminal tubules, or, in other words, looks upon these cystic growths as a variety of adenoma arising in the neighbourhood of the mediastinum testis.

FIG. 64.



A diagram showing the various structures concerned in producing cysts of the epididymis.—E, Epididymis. H, Hydatid of Morgagni. K, Pedunculated tubules, not always present, varying from one to three, and lying at the top of the testis. Below these are seen the functional efferent tubes, varying from one to twenty. P, Paradidymis. V V, Vasa aberrantia. (Bland Sutton.)

Mr. Eve has brought forward* a very ingenious, and with regard to the testicle (in which undoubted teratomata arise) a most interesting view—viz., that the epithelium and the cysts which originate in it date back to certain rudiments of the Wolffian body† which exist throughout life in the hilum testis. He supports this view (1) by the mixed character of the stroma in these cases, the presence of cartilage, and of striped or unstriped muscle,‡ which strengthen the view that they are of the nature of teratomata, and (2) by the fact that Prof. Klein has observed, embedded in the hilum of the normal testis, numerous groups of peculiar cells, probably derived from the epithelial columns of the Wolffian body, and lying between the laminæ of the inter-tubular connective tissue.

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* Erasmus Wilson Lecture on Cystic Disease of the Breast and Testicle.

† Mr. Sutton (*Lancet*, 1887, vol. i. p. 256) and Mr. Shattock independently (*Path. Soc. Trans.*, 1886, p. 287) had shown that the cysts in congenital cystic disease of the kidney originated in persistent Wolffian tubules which had become cystic. Mr. Sutton went further, and drawing a parallel between the above disease of the kidney and cystic disease of the testicle, traced the origin of the cysts in the latter to dilatation of the remains of the organ of Giraldès. Mr. Eve rejects this view, as "these tubular remains of the Wolffian body are situated between the testicle and epididymis, and altogether outside the testicle."

‡ The frequent presence of cartilage in growths of the testicle may be perhaps

Symptoms and Course.—It is well to bear in mind, for the sake of greater carefulness, the remark of M. Periquet, that in the more innocent forms of cystic disease of the testicle—*e.g.*, the fibro-cystomata—the characters of the swelling are almost entirely negative; there is nothing certainly diagnostic. The development is slow and insidious, the swelling free from tenderness or pain.* The size attained by the growth is usually moderate—*e.g.*, that of a turkey's egg, or a moderate-sized apple. Those in which it attained to the bulk of a cyst or of a child's head are exceptional. Owing to its slow course, and the fact that the tunica albuginea is thus long stretched without giving way, the ovoid shape is preserved till late. The surface is smooth, and any projections or bosses absent or slightly marked. It is only in colossal cases, as in one quoted by Kocher from the clinic of Prof. Lücke, that soft spherical projections, of a bluish transparency, show themselves, and are pathognomonic.

Careful palpation may detect a sensation intermediate between the hardness of a solid and the fluctuation of a liquid swelling. There is thus a feeling of pseudo-fluctuation, in places replaced by a certain depressibility, without actual fluctuation (Monod and Terrillon). If a puncture be made, serous fluid may be withdrawn, and may clear up the diagnosis. But it must be remembered that even if a cyst be hit off, which is not always possible, the contents may be too viscid to flow through a small cannula.

In the fibro-cystomata, neither the spermatic cord nor the lumbar glands can be made out to be enlarged; the general health is excellent.

Fibro-cystomata are very rare in infancy and childhood, and rare after fifty. The mean age at which their growth first comes under observation seems to be about thirty.

In the more malignant group, the cystic sarcomata (p. 424),

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explained by the original derivation of its stroma from embryonic cells lying in close relation to the proto-vertebræ. The presence of striped muscle may be explained in the same way, according to the theory of Cohnheim.

* Kocher speaks of pains present in the earlier stages, slight and transitory. He attributes these to adhesions between the layers of the tunica vaginalis, and to dragging taking place between them and the tunica albuginea.

the chief difference in the progress and symptoms is the more rapid enlargement; within a few months the size of a goose's egg is reached, and in 1½ years that of a fist, or even a child's head. On palpation the feel is more elastic, and softened spots can be more easily made out. The shape, feel, &c., will, however, vary according to the relative amount of sarcomatous and cartilaginous tissue which the stroma contains; it is noteworthy that many of those which have ended in rapid recovery have presented themselves, in the beginning, as swellings somewhat oval, with well-defined outline, uneven, slightly bossy surface, which is often hard under pressure—*i.e.*, with all the symptoms of a more innocent growth rich in fibrous tissue or cartilage.

Prognosis.—In the case of the cystic sarcomata this is extremely grave. In that of the more innocent form, the fibrocystomata, although the structure is apparently simple, innocent, and in no way calculated to lead to metastatic deposits, the outlook is always uncertain. While some patients remain well after castration, in others as distinct a generalisation of the growth takes place as in carcinoma and sarcoma. The explanation of this is probably that though the growth has appeared after removal to be a simple fibro-cystic one, some epithelial masses, or some myxomatous or cartilaginous tissue have been overlooked in the stroma.

SECTION X.

TERATOMATA.

This, a group of congenital cystic growths, includes the **two** following **varieties**:

(A) **A more complicated one, or Fœtal Inclusions,** in which fragments of bone, teeth, nervous tissue, part of the meninges, or even of the intestine, are present. (B) **A simpler form (Dermoid Cysts),** the inner lining of which resembles true skin, with cuticle, hair bulbs, and sebaceous follicles, containing the characteristic products—viz., epithelial scales in various states, hairs, cheesy and oily material.*

Between the above groups intermediate forms are found.

(A) **Fœtal Inclusions.**—These consist of cystic cavities with contents often extraordinary. The cyst appears often to be outside the testicle itself, adhering to the tunica vaginalis near the junction of the testicle and epididymis. But though apparently separated, the connection between the cyst and the testicle is usually in reality close and intimate. The cyst is lined with epithelium, squamous or cylindrical, it contains hairs, sebaceous glands, and sometimes muscular tissue and even teeth. The contents of the cyst include bony masses of two kinds; one in which the bone is ill-formed and irregular, perhaps recalling, more or less closely, one of the long bones, vertebræ or part of the skull, and any teeth present, though possessing fangs and crown like ordinary teeth, being commonly crooked and disposed in a disorderly manner, quite unlike the teeth in a jaw. In other cases the bone is better formed, and any teeth present are normal.*

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* The above varieties correspond to Kocher's "teratoma simplex" and "teratoma complicatum."

The soft parts contained may be even more extraordinary. Thus, Verneuil has described cerebral matter enveloped in a sort of pia mater; Velpeau, a portion of small intestine. The liquid in the cyst is sometimes thin and albuminous, at others fatty. When of the latter kind, the fluid solidifies on cooling. The cyst is sometimes compound, being subdivided into numerous smaller ones.

(B) **Dermoid Cysts.**—Here again we have a cystic cavity, the walls of which may be very complicated, but the contents are always of a simpler kind. The interior of the cyst, which often shows projections from its surface, is usually lined with squamous epithelium, degenerating into sebaceous matter, and also contains hairs and glands, and sometimes teeth. In a smaller number of cases the epithelium is cylindrical and the inner surface mucous rather than cutaneous. This is the case with the smaller or secondary cysts. External to the inner lining, cutaneous or mucous as the case may be, is a fibrous layer, the capsule proper. This may contain connective tissue of different kinds, muscular fibre, smooth or striped, and even typical nerve-tissue.

The exact **relation of the above growths to the testicle** remains uncertain. In some cases the connection is probably intra-abdominal, and the cyst with its contents accompanies the testicle in its transit. In other cases, according to Verneuil, the growth is originally formed in the scrotal tissues, independently of the testicle, to which it becomes closely connected later on.†

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* Thus, in a case given by Van Buren, a portion of well-formed lower jaw was found with several molars and a bicuspid tooth firmly fixed in it.

† Thus, in one case (Velpeau, *Clin. Chir.*, t. iii. p. 198; Cruveilhier, *Traité d'Anat. Path.*, t. i. p. 374) the growth could be dissected from the testicle, which was slightly atrophied.

But wherever the growth is developed, the testicle is liable to suffer, becoming atrophied, with or without inflammation.

As to the **mode of origin of these cysts** the following views have been put forward: (i) The theory of fœtal inclusion held by Geoffroy Saint-Hilaire,[*] according to which the more or less imperfect germs of a second fœtus have been included in the body (here the testicle) of another, of larger size and usually well formed. (ii) The view of Lebert, or the theory of *hétéropie plastique*—*i.e.*, the production of abnormal structures by forces existing in the parts. In other words, these teratomata are the result of departures from the natural formative processes in the testicle, the peculiar functions of the testicle and the ovary predisposing either gland, under certain circumstances, to the evolution of structures which, in the natural course of things, should result from the combination of their secretions.

At the present day the first theory, that of Saint-Hilaire, is adopted for the more complex teratomata, while the simpler ones, known as dermoid cysts, are thought to originate in a fault in the early development of the testis, at a time when it occupies a position near the caudal extremity of the embryo, a region in which the three layers of the blastoderm are not clearly limited from each other; the developing testicle can thus easily enclose tissues foreign to itself and bring them down with it in its transit, to be developed later on, after some injury.

Clinical History.—The fact that these growths are always congenital is important. Sometimes immediately after birth one side of the scrotum is noticed to be larger than its fellow, in other cases the presence of the growth is not recognised for many months. Verneuil has pointed out another fact of much importance, that these teratomata tend to pass through **two distinct stages**, (1) that of **indolence**, in which the growth remains entirely latent; (2) that of **inflammation**, in which the growth increases rapidly. If the inflammation run high, suppuration takes place, and the bursting of the abscess has been attended, or followed, by the discharge of oily or fatty matter, hair, teeth, or bony fragments, a fistulous opening sometimes remaining. The inflammation may be brought about by some injury, in other cases it seems to date to the access of puberty.

The varying consistence of the growth gives very valuable evidence; at one part fluctuation may be distinct, at another the finger may be met by hardness varying in degree from that of fibrous tissue to that of bony tissue. An exploratory puncture at one of the softest spots may draw off some of the characteristic liquids mentioned above, mingled with hairs. It may be well here to use the aspirator, or to make, antiseptically, an exploratory incision.

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[*] *Hist. Génér. et Partic. des Anom. de l'Organ*, t. iii., Art. "Monstres Endocymiens."

Other points as to weight, absence of pain, &c., are of little value; size may be of importance when in a long standing growth great bulk is reached, as this excludes other growths of the testicle.

Prognosis.—The growth is not to be lightly spoken of as innocent. We know that sebaceous growths of the scalp may eventually develop into malignant swellings, and that the same complication may occur with ovarian dermoids. For these reasons teratomata should always be attacked early. This course also gives the only chance of removing them before the adhesions between them and the testicle have become dense, or of finding the testicle unaltered by inflammation, &c.

Treatment.—As a rule castration will be required, especially if the growth is of long standing. But it will always be justifiable to incise freely a soft and fluctuating spot, evacuate the fluid contents and remove the more solid ones with a sharp spoon or forceps. This must be completely done or a troublesome fistula will result. The cyst, having been thoroughly evacuated and scraped out, should be drained and made to close from the bottom, so that no proliferation of its lining membrane may take place. But prolonged attempts at evacuation, and still more, at complete removal of the cyst, may easily lead to injury of the tunica albuginea and the testicle itself. In all cases of long standing, and where it is clear that obliteration of the cyst will not follow on its evacuation, castration should be performed.

CHAPTER IX.

GROWTHS OF THE TUNICA VAGINALIS.

THESE are of very rare occurrence. A few new growths belonging to the connective-tissue group (lipomata, fibromata, sarcomata) have been met with. These must not be confused with new growths of the spermatic cord occurring low down.

LIPOMA.

There appears to be one well-proved instance of this recorded by Dr. Park of Buffalo (*Trans. Amer. Surg. Assoc.*, vol. viii.; *Ann. of Surgery*, May 1886, p. 365). The patient, aged forty, had noticed an almost painless, slow, but continuous enlargement of the right side of the scrotum for eighteen months, in which time it had reached the size of a cocoanut. The scrotum was filled by a large mass which crowded the left testicle into a small space at its upper part. The mass was solid, yet soft, with ill-defined fluctuation, but puncture revealed no fluid. The skin was freely movable, and there was no evidence of malignancy. The right testicle was at the upper part of the swelling. When at the operation the tunica vaginalis was exposed, it only showed a distended condition. An incision into it revealed a mass of densely packed fat. After the lobular masses had been shelled out, which was easily done, the right testicle was found to be not merely embedded in, but incorporated with, the fat by apparently intimate connections. The growth was supplied with blood both by the vessels of the cord and by those of the testicle. The former traversed the growth for about two inches. The external ring and canal seemed normal, there being no evidence of past or present hernia. As the fibrous trabeculæ and vessels radiating from the testicle into the mass were so numerous and distinct, castration was performed, and the man made a good recovery. Dr. Park was unable to come to any positive conclusion as to the exact point of origin of the growth.

This case of Dr. Park's is at present the only well-authenticated one of the kind. Others described as such have been lipomata of the cord or scrotum.

FIBROMA.

Instances of this arising really in the tunica vaginalis, without origin either in the testicle, epididymis, or cord, are very rare. A case of M. Baizeau (*Un. Méd.*, 1861, t. ii. p. 451) is a good example. A man, aged twenty-six, noticed, after a blow, a swelling in the right side of the scrotum, which, six years later, had reached the size of a goose's egg. The swelling was hard, unyielding to pressure, and surrounded the testicle from before backwards, so as only to leave free a small portion of the sides. It was removed, together with the testicle, being too intimately blended with it to admit of separation. It was then found that the growth was developed within the thickness of the tunica vaginalis, between its fibrous and serous layers. It was moulded upon the testicle, on the lateral borders of which its edges gradually thinned away. The epididymis and cord were healthy. Microscopically, the growth was entirely composed of fibrous tissue.

MM. Monod and Terrillon give another case (of Ricord's), in which at the operation the testicle was saved, but a large part of the parietal tunica vaginalis, in the thickness of which the growth was developed, was removed.

Mr. Holmes has recorded (*Path. Soc. Trans.*, vol. xx. p. 286) a case which may have been of this nature. The patient's age was fifty-one. The growth was as large as a cocoanut, and had been noticed for thirty-three years; it was hard in some parts, but soft at others. Castration was performed owing to the size of the swelling and the uncertain position of the cord. On examination the growth was thought to be situated in the tunica vaginalis; a layer like the cremaster could be peeled off it. In the centre the mass was breaking down. Microscopically, it consisted of fibrous tissue.

In other cases the growth, though adherent to the tunica vaginalis, seems to have been extra-vaginal in origin. This was so in a case of Mr. Heath's (*Path. Soc. Trans.*, vol. xx. p. 184) in which, after castration, the growth was found to be connected with the areolar tissue of the cord, and closely attached to the back of the epididymis and the tunica vaginalis. It was fibrous in structure and sloughing internally, the sloughy portion communicating with a scrotal fistula which had formed six weeks before. The patient was aged thirty-six, and the swelling had been noticed sixteen years. In another class of case these fibrous growths are certainly scrotal in origin, becoming later on intimately associated with the deeper parts.

Like the teratomata, these growths may exist for a great number of years and attain a huge size, but, unlike them, they are not congenital. In those cases where they closely surround the testicle, it is very difficult to distinguish them from an ancient orchitis or hydrocele: the site of the gland should always be sought for by testicular sensation.

As these growths eventually attain a cumbrous size, as they then may slough and bleed, and as they may become sarcomatous, they should always be removed early, as this step alone gives much chance of saving the testicle. But in many cases, owing to the complexity of the relations of the growth, and the risk of injuring the cord, castration will be necessary.

SARCOMA.

Instances of this form of growth attacking the tunica vaginalis alone, without implication of the testicle or cord, are extremely rare.

Two cases are given by MM. Monod and Terrillon. The first is recorded by M. Reverdin of Geneva (*Rev. Méd. de la Suisse romande*, 1886, t. vi. p. 305). In a child of seven, the left half of the scrotum showed a swelling which in two months had attained to the size of a lemon. This, which had all the appearance of a large hydrocele, only fluctuated indistinctly, save at one spot, behind and above, where fluid was clearly present. Here also translucency was evident, elsewhere it was doubtful. The testicle could not be felt. An exploratory puncture gave vent to a yellowish fluid of the consistency of white of egg. On incision of the scrotal tunics, a greyish-yellow gelatinous mass protruded, which was easily shelled out of the cavity of the tunica vaginalis by the fingers alone. This serous sac was violet in colour, and bled readily. The testicle was normal. The wound did not heal completely, and, a month later, the swelling reappeared. Two months after the operation M. Reverdin saw the child, and there could then be no doubt as to the nature of the growth. The scrotal swelling could be traced up into the abdomen, and the wound was fungating. Microscopical examination of the growth showed it to be a myxo-sarcoma, with spindle cells, the inter-cellular matrix being myxomatous.

The second is one of Dr. Ore's, of Bordeaux (reported by Dr. Dudon, *Bordeaux Médical*, 1873, p. 259). The patient, aged forty-one, had had for three months on the left side a swelling which resembled in many points an ordinary hydrocele, but was not translucent, and only elastic to pressure. The testis was behind. A diagnosis being made of hæmatocele, during the course of an incision a solid greyish growth, which to the unaided eye and microscopically "avait les caractères du tissu cancereux," protruded between the lips of the wound. The patient left the hospital, a month later, well, but unfortunately the account stops here.

Mr. Curling quotes the following cases. One recorded by Sir E. Home (*Observations on Cancer*, p. 125) is that of a gentleman in whom a doubtful scrotal swelling had been diagnosed by some as hydrocele, by others as hæmatocele. John Hunter when exploring the swelling found a thickened tunica vaginalis within which was a grumous and gelatinous substance, with blood clot. Castration having been performed, the testicle was found to be healthy, but small from the pressure of the growth in the tunica vaginalis. The wound healed quickly, but the patient died some months later with evidence of secondary abdominal deposits. The presence of these was verified by a necropsy.

Mr. Craven (*Med. Times and Gaz.*, 1859, vol. ii. p. 207) removed a scrotal swelling including both testicles, which had existed two months and was increasing rapidly, in a man aged forty-five. It consisted of a large mass of "medullary cancer," surrounding both testicles, which were healthy. The patient recovered, but died a few months later with evidence of internal disease, probably malignant.

With regard to the origin of these growths, Kocher has suggested that they arise in malignant degeneration of the clots and false membranes of hæmatoceles. This view is scarcely supported by the preceding cases, especially that of the child. MM. Monod and Terrillon consider that these sarcomata are endothelial in origin.

The diagnosis must always be difficult, if not impossible. The rapid progress is very important.

Treatment.—An antiseptic exploratory incision should be made early, and castration performed at once.

CASTRATION.

This operation is remarkably safe and simple if antiseptic precautions are carefully taken, and if attention is paid to the following details. The parts should be shaved and cleansed, first with soap and water and then with a solution of mercury perchloride 1–2000. The patient being brought under the influence of ether or A.C.E. mixture, upon a table of convenient height, the surgeon carefully ascertains the absence of any hernia upon the side to be operated upon. If one be present and reducible, it should be completely returned and pressure kept up by an assistant over the internal abdominal ring. At the close of the operation, the funicular process of the peritoneum, having been separated right up to the internal ring, should then be secured at the very highest possible point, either by ligature or, as I prefer, by torsion and ligature, the twisted sac being transfixed and tied. This step will secure a shutting off of the peritoneal cavity from the operation wound, and give the patient a good chance of a radical cure of his hernia. If any hernia present be irreducible, the operation of castration should first be completed, if possible, without interfering with the hernia, the sac of which is then opened and (unless the patient's age or condition make this step unadvisable) the adhesions separated, any intestine returned, and omentum removed after ligature, and the sac then dealt with as above.

I am not aware of any case of castration in which an irreducible hernia was actually present, but the following cases show that such a condition is possible. In the course of a castration, the funicular process was unexpectedly found to be open, and during the patient's struggles and coughing a small piece of omentum shot down. It was readily returned, and no evil resulted (Rivington, *Lancet*, April 14, 1877). Curling in two cases, while dividing the cord, accidentally opened a sac containing a small piece of omentum, of the existence of which he was not aware. Sir E. Home (*Observ. on Cancer*, p. 236) relates a case where, after the operation had been completed and the wound dressed, a fit of coughing forced off the dressings and caused a protrusion of several feet of small intestine, the patient having had a hernia the descent of which had been prevented by the enlarged testicle. The narration of this case suggests that the suturing of wounds and the application of a spica bandage must have been very differently carried out at that day to this. Finally, Sir G. Humphry, after performing castration upon the dead subject found that the lower part of a hernial sac had been removed with the testicle.

The extent and length of the incision will vary with the size of the swelling and the disease which calls for the operation. Thus, in tubercular cases it will usually be sufficient to begin just below the external ring. Where malignant disease is present, or suspected, the incision should begin well over the canal, and may have to be continued higher. In any case it should come quite to the bottom of the scrotum so as to ensure free and ready drainage. Before making the incision, the surgeon so grasps the swelling as to make the coverings tense. In cases where the skin is involved by a growth or the seat of one or more fistulæ, two elliptical incisions should be made meeting above and below. And in those cases where the skin is extremely stretched, but not involved, it will be well to take a similar step, as this will remove the risk of sloughing, and that of leaving a troublesomely bagging lump.

In those cases where any doubt exists as to the exact nature of the disease, as where an old hæmatocele may be mistaken for a new growth, the cavity of the tunica vaginalis should next be opened by another incision, and the testis itself examined so as to clear up the nature of the case. Where the operation is proceeded with, the cord should be quickly exposed just below the external ring, isolated with the finger, and the scrotal coverings rapidly shelled off the diseased testicle by the right index, while the left hand still further protrudes the organ. Up to this stage there will have been no bleeding of any consequence, as only some branches of the external pudic have been divided with the knife, and any scrotal vessels will have been torn through. Thus it will be sufficient to apply Spencer Wells' forceps to any bleeding points, which will be closed later on either by this forcipressure or by the sutures; no time need be lost in using ligatures, and the forceps will act usefully as retractors. Two or three points require attention at this stage of the operation. Where there are many cysts and softened patches in the line of the incision the knife should be used carefully; a testicle which is the seat of a rapid or soft growth shells out much more easily if its substance has not been cut into. The mode of shelling out the testis mentioned above may be found impossible owing to adhesions and matting which call for knife or scissors. In such cases any skin that is left very thin should be removed. Where the diseased testicle is of large size, care must be taken to avoid wounding the urethra or corpus cavernosum, and the opposite gland must be drawn out of the way by an assistant.

The next step is the securing of the cord. This structure must be isolated as high as necessary, the inguinal canal being laid open on a director, if this step is required to enable the surgeon to get well above the disease. When the operator has to follow up the cord in the canal he will remember the existence of the deep epigastric artery. The quickest, simplest and safest method of securing the cord is by transfixing it, by means of an aneurism needle, with a double ligature of carbolised silk, or stout chromic gut, interlocking these ligatures so that no vessel can escape between them, and then tying the cord in two halves. The absolute safety of the ligature depends on the following precautions being taken, an antiseptic condition of the wound, embedding of the ligature by transfixing the cord, interlocking the ligatures especially in the case of a large vascular, soft cord, and finally tying them with the utmost tightness; to secure this end the ligatures are finally tightened up by being looped round two pairs of forceps or scissors. If it be preferred, in the case of a very voluminous cord, to tie each vessel separately, the operator raising the cord with his left hand severs it, at a spot he has fixed upon as safe, bit by bit, each vessel as it bleeds being seized by Spencer Wells' forceps, and secured later on by chromic gut or fine silk ligatures. But as this method is tedious; as where the vessels are numerous and large, it is attended with some loss of blood; and, as above all, where the part of the cord to be dealt with is high up, and has much tension on it, it is much more likely, especially when slippery with blood, to escape out of the fingers, it is vastly inferior to the first. As to the objections which have been brought against the ligature in two halves—viz., tetanus, pain, secondary hæmorrhage, and sloughing—there is but one answer, that, at the present day, they do not exist. Tetanus may in old days have followed this method, being brought on by a septic state of the wound, or by not tying the ligatures with sufficient tightness. Severe pain may follow this method, unless the above-given precaution is observed to use ligatures strong enough to bear being thoroughly tightened up, so that the numerous nerves may be at once and completely strangled. So, too, with regard to hæmorrhage and sloughing or inflammation of the cord; the first will not occur if a suitable ligature is properly applied, and the latter will certainly not follow if due precautions are taken to secure an aseptic condition of the wound. In support of the strongly expressed belief in the superiority of the ligature used as above, I may say that I have employed it in seventeen cases, and that in not a single one did any trouble follow. Two of the patients died, one three weeks after the operation, from advanced tuberculous disease; he was a gentleman with pulmonary phthisis whom I had advised at his last visit, five months before, to have his disease attended to at once. The other case died three weeks after the operation for encephaloid sarcoma, which recurred *in situ* and also spread to the abdominal glands. This patient, a cabman, also refused operation at first, and only sought admission when the colossal growth had implicated the skin, and prevented his any longer getting up on to his box.

As I consider the method of ligature properly used to be by far the best, I shall not waste time in describing other methods which have been recommended by some writers, such as the tedious and uncertain (as to hæmorrhage) écraseur, the septic galvano-cautery, or the tedious elastic ligature, which, like the clamp, prevents primary union.

One or two points require attention. The spot at which the cord is severed should always be at least half an inch below the ligature. If a safe site of section cannot be otherwise obtained the inguinal canal must be slit up as above directed, the peritonæum carefully depressed and peeled out of the iliac fossa, and the cord tied as high up as possible. If the peritoneum be opened an aseptic sponge should be put over the spot at once, and the opening later on tied up, or sutured according to its size. As the different constituents of the cord separate at the internal ring, taking different courses at this spot, some lymphatics going to the lumbar glands, and others, along the spermatic vessels, to the aortic glands, I do not think any good purpose will be served by attempting to follow up the cord beyond this point. The higher the cord is divided, the greater will be the tension; in these cases the surgeon must never trust to the fingers of an assistant, however capable. There is not sufficient room for these, and the operator himself encroaches upon and disturbs their security. When a high division has to be made, the end should be transfixed by a tenaculum, which inflicts less damage than compression forceps.

Especial care must be taken to secure the end thoroughly if a hernia be present. Curling quotes a case recorded by Jules Cloquet, in which secondary hæmorrhage from the cord gave rise to a large effusion of blood within the peritonæal cavity. The patient died, and it was found that the blood had entered the abdomen through a hernial sac divided at the same time as the cord.

If secondary hæmorrhage should occur, it will be due either to the ligature, which was not embedded, slipping off as the end shrinks, or, if the vessels have been tied singly, to one or more having been overlooked owing to their not bleeding at the time of the operation. The canal must now be laid open, retractors employed, and the bleeding point found. This must always be done at whatever cost of time and trouble, or a fatal result is almost certain from the results of hæmorrhage and septic peritonitis combined. The following is a good instance :—Prof. Spence, of Edinburgh (*Lancet*, July 26, 1856) in a case of malignant growth of the testicle and cord, was obliged to lay open the canal before dividing the latter. The vessels of this were secured by separate ligatures. Secondary hæmorrhage came on in a few hours, followed six days after the operation by peritonitis and death. It was found that effused blood had separated the parietal peritonæum from the fascia transversalis, a coagulum had then formed within the iliac fossa, and breaking down had caused ulceration of the peritonæum.

The cord having beenduly secured, the Spencer Wells' forceps removed, and the wound scrutinised for any bleeding points, a few scrotal vessels, notably one in the septum, will probably require ligature with chromic catgut. Drainage is then provided and the wounds secured with sutures of carbolised silk and horsehair. I prefer these to the material I use in other cases—viz., salmon gut—as less likely to irritate the scrotum. In applying the sutures care must be taken not to leave the edges curled in or inverted by the dartos. This may be partly prevented by the use of hot lotions, but chiefly by painstaking insertion of the sutures.

During the performance of the operation, strict antiseptic precautions must be taken—viz., due cleansing of the parts, irrigation with mercury perchloride (1–4000), arrest of all hæmorrhage, drying out the wound, most carefully, before the sutures are finally tightened—it is well while they are being inserted to leave a strip of sponge in the wound—and providing sufficient drainage. Patients who have to submit to castration are often depressed in mind, if not reduced in health; a low form of cellulitis and erysipelas may thus easily follow, while if the discharges become septic, fatal thrombosis is very likely to follow on a wound made in a region so rich in lymphatics and loose cellular tissues.

The dressings, of sal-alembroth or iodoform gauze, should be applied so as to cover the wound sufficiently, while a perforation or notch in the outer layer allows of the penis coming through. Iodoform powder and boracic acid should be dusted into the perineum, and a pad of carbolised tow, separate from the rest of the dressings, kept over the anus. Care should be taken in applying the dressings to keep the scrotum well up upon the pubes.

Castration for a retained testis has been already spoken of (p. 68). Other indications for the operations will be found by referring to the index.

CHAPTER X.

LESIONS OF NUTRITION.

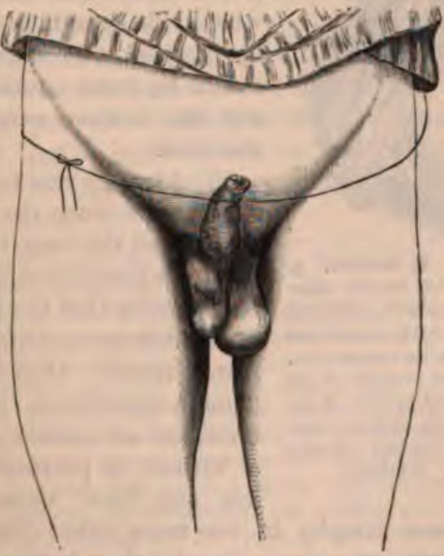
convenience' sake it is very desirable to have a sufficiently rate standard of the weight of the testicle. Mr. Curling idered 6 drachms to be the ordinary weight of the sound cle of a healthy adult. He would therefore have looked upon sticle of an adult which weighed upwards of an ounce as ertrophied, and one which weighed less than 3 drachms, as in te of atrophy.

SECTION I.

HYPERTROPHY OF THE TESTICLE.

here the development of one testicle has been arrested, or re one has atrophied, or been removed, its fellow may, especially

Fig. 65.



Hypertrophy of left testicle compensatory to mal-development of the right one from pressure of a congenital hydrocele upon the cord. (Clutton.)

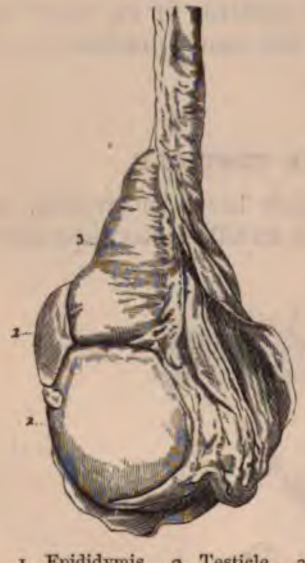
during the years of adolescence or early manhood, undergo marked hypertrophy (Fig. 65). In the case of iliac retention of Mr. Woods, Fig. 4, the right testis was double its natural size. No better instance of this exists than that related by Mr. Page, of Carlisle, to Mr. Curling, of a lad, aged seventeen, who died of machinery injuries. Only the right testicle was in the scrotum, the left did not exist. Even after the tunica vaginalis had been cut away, the testicle weighed 2 oz. 2 drachms and 2 scruples.

ATROPHY.

Under this heading two distinct conditions must be included. (i) **Atrophy Proper**, the wasting of a testicle which has attained its full development (Fig. 66).

(ii) **Arrest of Development.** Here the perfect evolution and development of the testis is arrested for some time, or never takes place at all.

FIG. 66.



1, Epididymis. 2, Testicle. 3, Fatty tissue. A left testicle taken from a man, aged forty-six, who died of renal dropsy. The gland was wasted to one-fifth its natural size. In addition to the presence of fat beneath the visceral portion of the tunica vaginalis, fat globules were found irregularly disposed amongst the wasted tubuli. (Curling.)

(i) **Atrophy.**—This may result from a variety of conditions, many of which have been already alluded to. They will be conveniently remembered by a useful classification employed by MM. Monod and Terrillon, who divide them into the two following groups: (A) **Atrophy brought about by local causes.** (B) **Atrophy due to some cause acting at a distance.**

(A) **Atrophy due to Local Causes.**—These are much the most common causes, and the most frequent among them is inflammation. Thus we have already seen that the different forms of epididymo-orchitis, some acting more readily than others — *e.g.*, mumps, gonorrhœa, injury, typhoid fever, are all causes, and that with or without a previous abscess. *It* has also been shown that injury may bring about atrophy in two ways, either directly, as after *a* blow or squeeze, or more indirectly, though this is much more rare, through an injury inflicted upon the spermatic cord, thus etting up an inflammation which, a little later, reaches the pididymis and testicle. What appears to be a good example of his rare condition—in this instance followed by very marked trophy—has lately come under my notice. A lad, aged fifteen, vell-grown for his years, came under my care at Guy's Hospital or marked wasting of the right testicle. Nine months before, vhen stooping, and lifting a heavy roll of cloth in a warehouse, e felt a sudden pain in both groins. The testicles quickly welled, and the same evening were tender, much swollen, and ery painful. He was unable to work for ten days. He was ositive that he had never had any urethral discharge, and that e had not had mumps. His manner was frank and open, and in o way suggested the habit of masturbation. The swelling subided, but while the left testicle became entirely normal, the right ad continued to waste steadily. When he first came to me it vas of the size and almost the consistency of a small piece of oral studded with irregular nodules densely hard and quite nsensitive. The epididymis appeared to have suffered equally, small vas deferens being traceable directly into the back of the esticle, no globus minor and epididymis being made out between hem. Here the epididymo-orchitis and atrophy seem to have een brought about by inflammation set up originally by a violent ontraction of the abdominal muscles upon the cord as it passes long the canal.* No other cause could be detected. I gave a ery unfavourable prognosis owing to the time that had elapsed ince the inflammation, and the condition of the testicle. Two nonths later the testicle had dwindled further, and was then of the ize of a small pea. The other testicle was plump and perhaps ypertrophied, but it must always be difficult to judge of the orrectness of this in a lad, without a fair test of comparison in he opposite organ.†

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* On this point I would refer my readers to the cases of epididymo-orchitis fter sprain recorded at pp. 298, 299.

† Mr. Curling gives (*loc. supra cit.*, p. 78) a somewhat similar case in a patient ged twenty-two, who, about four years before had strained himself in lifting heavy weight; shortly after the right testicle swelled and became painful, and hen gradually wasted, becoming no larger than a pea. After a second strain hree years after the first, the left testicle became swollen and inflamed and fterwards began to waste; when examined by Mr. Curling it was about the ize of a pigeon's egg and very firm, but free from the irregularities and indurations commonly met with after severe orchitis. Mr. Curling does not explain ow the strains produced the inflammation and wasting, and there is this fallacy bout the case (which may perhaps have been present in my own quoted above) hat the patient had been addicted to excessive masturbation, and had only bandoned the practice a year before his visit to Mr. Curling.

Cases have occasionally been met with in which the inflammation which has led to the wasting has been set up by inordinate venereal excitement, either in sexual intercourse or masturbation (Brodie, *Lond. Med. and Phys. Journ.*, vol. lvi. p. 297; Curling, *loc. supra cit.*, pp. 78, 79). It is not stated whether, as often happens in these cases, the inflammation and wasting were accompanied by neuralgic pains.

Other instances of inflammation, now of a chronic kind, ending in atrophy, it may be of a very marked degree, are seen sometimes to follow diffuse syphilitic orchitis, combined with gummata, which runs on to cirrhosis of the testis (p. 310). In tubercular disease, limited to the epididymis, the testicle is often small and flaccid. In those cases, rare nowadays, where much of the testis has protruded as a fungus, and the rest is converted into a mass of quiescent cheesy deposit or calcareous masses, atrophy may be extremely marked.

In other cases the atrophy has been brought about in part by inflammation, in part by pressure. Instances of these combined causes are given occasionally by large and long-standing thick-walled hydroceles (p. 133); hæmatocele (p. 223); elephantiasis of the scrotum (*vide infra*). Retained testis, as a cause of atrophy, has been mentioned at p. 62.*

We now turn to (B) **those causes of atrophy which act from a distance.** They may be divided into the following groups: (1) *Atrophy from disturbance in the blood supply;* (2) *Atrophy from altered nerve supply;* (3) *Atrophy in which the above causes are combined*, as in those cases in which the size of the testis is diminished during long wasting disorders—*e.g.*, phthisis.

1. *Atrophy from Interference with the Blood Supply.*—The following case (Wardrop's note to his edition of Baillie's Works, vol. ii. p. 315) is one in point, though here it must be remembered that nerve influence was also interfered with, the sympathetic nerves having been pressed upon as well. A patient, both of whose testicles were completely absorbed, nothing being felt in the scrotum but a loose vaginal coat, died of an aneurism of the aorta which formed at the origin of the spermatic arteries, both of these being obliterated. Ligature of the spermatic artery will also cause wasting of the testicle, a fact which led Harvey to propose the adoption of

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* Atrophy of the testicle may be due to the constant pressure of an ill-fitting truss; a condition rendered possible, though rarely brought about, by the extraordinary state of the trusses which any one in large hospital practice sees from time to time, and the no less extraordinary additions which some of these patients make to their instruments.

this step for the removal of certain growths, a suggestion the credit of which has, according to Mr. Curling, been wrongly given, in recent years, to Maunoir of Geneva.

In large varicoceles the interference with the circulation may impair the nutrition of the testicle and produce some diminution of its size. It will be seen, however ("Varicocele," Part II., DISEASES OF THE CORD), that this very rarely amounts to serious atrophy.

2. *Atrophy of Nerve Origin.*—The cause of this may arise in the spinal cord or in the brain. (*a*) *Atrophy arising from mischief in the spinal cord.* From the cases recorded it seems usually to follow on injuries to the dorsal and lumbar regions. In the *Medical and Physical Journal*, vol. xx., a case is recorded of recovery after fracture and dislocation of the first and second lumbar vertebræ followed by paraplegia, in which, three years later, the testicles were found entirely obliterated. Klebs (*Handb. d. Path. Anat.*, S. 995) refers to cases of injury to the dorsal and lumbar cord, followed by softening of the testicle and cessation of sexual desire.*

(*b*) *Injuries of the head* have occasionally been followed by atrophy of the testicles. Old writers on military surgery—*e.g.*, Larry, Napoleon's chief surgeon—have mentioned cases in which injuries of the back of the head from gunshot or sabre wounds were followed by atrophy of the genitals and loss of virility. Mr. Curling records one case in which a fall on the back of the head, in a man aged fifty-seven, was considered by him to have been the cause of complete loss of virility and atrophy of the genitals. But in this case it is to be noted that other injuries were received at the same time—viz., a sabre cut on the forehead, and a bayonet wound in the side.

Until we know what part of the brain is in relation especially with the lumbar sexual centres and the genitals, we cannot explain these cases. To elucidate them the old theory of Gall that the cerebellum is the seat of the sexual appetite, has been resorted to. MM. Monod and Terrillon appear to accept this view, which has on the other hand been rejected by many writers—*e.g.*, Leuret,† with whom Prof. Ferrier entirely concurs. All we can say is that it is probable that paths‡ run up from the genital centre to the brain (p. 479) through the medulla, pons and crura cerebri, and that it is lesions of these and not any portion of the cerebellum which account for wasting of the genitals after injuries of the back of the head and cervical spine.

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* Possibly this is brought about by injury to the genital centre which is situated in the lumbar cord. This centre is referred to later (p. 479).

† "Ni la pathologie, ni l'anatomie anormale, ni l'anatomie comparée, ni la physiologie expérimentale tendent, par conséquent, à faire admettre le sentiment de Gall sur les functions de cervelet." (*Traité de Physiologie*, vol. iii. p. 466.)

‡ Eckhard has shown (*Beiträge*, Bd. vii. S. 67) that the vascular turgescence

It was formerly much disputed whether iodine could cause wasting of the testes, and also of the ovaries and mammæ. This point seems first to have been brought forward by Cullerier. In one case, a young man took from twenty-five to thirty drops of the tincture of iodine for three months, this being followed by impotence and atrophy of the testes, the latter never completely recovering. In the other case, in which the iodide of iron was given, the loss of virility was temporary. Velpeau, on the other hand, never observed a case of atrophy from this cause. When cases of this kind are brought forward, two possible fallacies must always be remembered, one that the atrophy of the testes may be due to syphilis (p. 315); the other that the loss of virility may be part of the general depressing effect of the iodide, without any real atrophy being present.

On this subject the following words of Mr. Hutchinson are conclusive (*Syphilis*, p. 49): "The fear of causing absorption of the mammæ or testes by the prolonged use of iodides exercises but little influence on the minds of modern prescribers. Although, however, these results are very infrequent, yet it must be fully recognised that the iodide does often depress the sexual function very definitely while it is in use, and possibly in some instances does permanent injury to it. Many persons become low-spirited and miserable whenever they take it." *

It remains to refer to two other instances of atrophy of the testicle. First that usually described as belonging to old age, but which, like old age itself, is in each case to be judged of by itself, not by the baptismal register, but by the life which the individual has led. This senile atrophy, with its anæmia, degeneration of epithelium, and slow shrinking of the gland, may normally be expected after fifty. I only refer to this obvious fact because there are certain patients who forget it—patients who expect their sexual fires to last as long as they do, and who appear to be indignant at any sign of these being extinguished.

Finally, there is a small group of cases in which the most

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which is the immediate cause of erection, may be produced by irritation of the pons, and as high up as the crura cerebri.

* The late Mr. Berkeley Hill (*Syphilis*, p. 424) was of opinion that there was no sufficient foundation for the belief that iodine caused wasting of the testes and mammæ.

careful investigation of the case fails to discover any cause of the atrophy.

(ii) **Arrest of Development.**—This condition, in which the testicles never attain to their proper size, is to be distinguished from atrophy of a once well-developed organ. A good instance is the arrest of development met with in retained or ectopic testes (p. 62). Other instances are occasionally met with in testicles that have reached the scrotum. In these cases the testes retain the characteristics of infancy, childhood, or boyhood. The development to which they attain at puberty is either much delayed, or more commonly, is never reached at all. Going with this are a characteristic group of symptoms—viz., from excess of fat, plumper, more rounded outlines than are usually met with in the male, prominent mammæ, the hair on the face and pubes absent or scanty, and a shrill treble or falsetto voice. Very rarely the arrest of development affects one testicle more than its fellow. This arrested condition of the testes sometimes occurs with defective development of the brain, the patients being of weak mind, idiots, &c.

Morbid Anatomy.—Two forms of atrophy of the testis are met with, and these correspond in some measure to the causes by which the change has been brought about. (A) In **one**, which includes all those cases of atrophy due to inflammation, there is a sclerosis of the connective tissue of the gland, by the shrinking of which, as in scar tissue, the delicate secreting structure is destroyed. (B) Of **the other** form, much less common, and in which inflammation has not played any important part (we may take as an example the atrophy which follows cutting off of the blood supply, or that due to nerve lesions), the wasting of the gland is due here rather to a fatty degeneration, the glandular and not the interstitial tissue being primarily attacked, and degenerating without any overgrowth and contraction of the connective tissue.

(A) This, **the more common form,** is well seen in cases of traunatic and syphilitic orchitis. The appearances, naked-eye and nicroscopical, which would be found in these varieties of atrophy, icute and chronic alike, and which may be summed up as a result f peri-orchitis and interstitial orchitis, have been already described t p. 305. It must suffice here to recall the hard, nodular testis, f the size, perhaps, of a bean, the section showing a thickened lbuginea and interlobular septa, the usual buff-coloured, slightly ranular surface of the section being replaced by bands of connecve tissue, from which here and there a few scattered tubules can be drawn out only to break off short, without unravelling. This form of atrophying orchitis and peri-orchitis has been called by some French writers "diffuse" sclerosis, the whole organ being generally affected. In other cases, where the inflammation has been more partial and localised, the less well chosen term "systematic" sclerosis is given. Owing to the thickening of all the connective tissue, peri-lobular, peri-tubular, peri-vascular, and the intimate association between them all, the seminal tubules are gradually strangled, their walls disappearing, their outlines being effaced, and the epithelium becoming converted into a granular and pigmented *débris*.

(B) **The Rarer Form.**—Here there has been no inflammation, and the decay of the gland is rather of the nature of a fatty degeneration. This form is met with in cases where the blood supply has been feeble, as in those who die of wasting disorders, and in the aged. As there has been here no inflammation, the testicle, though now also much reduced in size, is not hard and nodular, but soft and flabby, instead of being healthily plump, firm, and yet elastic. A section of the gland shows its structure to be anæmic and fatty-looking, the tubules can still be found, but are unravelled with difficulty. A good illustration is given in Fig. 66, which was taken from a patient aged forty-six, who died of renal dropsy. In addition to fatty degeneration which was found in the substance of the testicle itself, fatty tissue was found beneath the visceral tunica vaginalis, encroaching upon the epididymis and the back of the testicle.

In this form, as in the other, the epididymis is affected, though often somewhat later than the testicle; in the first-mentioned form, where inflammation may have fallen upon both epididymis and testicle at the same time, the atrophy of both is more contemporaneous. The structures in the end shrink, the cremaster disappears, and the vessels and nerves are much reduced in size and number. Fluid injected into the vas deferens penetrates, according to Mr. Curling, as far as the commencement of the epididymis, or even up to the vasa efferentia.

Prognosis.—This must of course vary with the cause of the atrophy. As will be seen from the account given above, many of these do not admit of remedy. Of those following inflammation, the cases in which the mischief has been traumatic and severe, and those due to untreated syphilis, are the worst in outlook.

Sequelæ.—As has been mentioned above, a neuralgic condition may be present. Where the condition is advanced and bilateral, or where the vas or epididymis on the opposite side is blocked, sterility will of course result. Development of certain female characteristics has been noticed in several cases. The most remarkable of these, the enlargement of the mammæ, has been differently explained, but its nature is still doubtful. It is certainly sometimes due to a mere heaping up of fat, of a similar kind to that which, taking place elsewhere, gives an unmanly plumpness and rounded outline to the figure. In other cases there appears to be a real hypertrophy of the glands. Thus, M. Lereboullet (*Gaz. Hebd.*, Août 1887) records the case of a young man, aged twenty-two, attacked with complete atrophy of the testicles after mumps. The breasts were voluminous, and hypertrophied lobes and the granular feel of breast-tissue were easily made out.

Such cases are probably another instance of the sympathy between the breasts and the testicle, which makes itself known about puberty by well-known temporary aches and discomfort.

Treatment.—This must be preventive in some cases, in others directed to remove the cause. It will be again alluded to under the heading of sterility.

CHAPTER XI.

IRRITABLE AND NEURALGIC TESTICLE.

SOME writers — *e.g.*, Mr. Curling — have separated the above affections, meaning by **irritable testis** merely a morbid sensibility of the gland, and by **neuralgic testis** a much more painful affection, akin to true neuralgia, one in which the pain is sudden, severe, and intermittent, occurring in paroxysms of variable duration. But while typical cases of the two conditions are no doubt met with, they blend insensibly together by cases which ally the one to the other, and I have accordingly described the two conditions together.

As the prognosis and treatment here especially depend upon the causes, and, as these are most various, it will be convenient to adopt some such classification as the following:

A. **Cases where no lesion can be detected either in the testicle or in parts at a distance from it.**

B. **Cases where some lesion exists in the testicle or its annexa.**

C. **Cases where the lesion exists in some part quite removed from the testicle or its annexa.**

A. **Cases where no Lesion can be Detected.**—This at once raises the question whether such cases exist, and whether a cause cannot always be found. Such authorities as Gosselin and Kocher hold this opinion, others—*e.g.*, Sir A. Cooper and Mr. Curling—believed that an essential neuralgia of the testicle did exist. If this view be correct, such cases are very rare, one of the causes given in the following list being usually present.

B. **Cases where some Lesion Exists in the Testicle or its Annexa.**—The causes here may be met with in the testicle or epididymis, or both, or in the cord, or even the vesiculæ seminales. Not unfrequently the cause lies in some congestion or inflammation of the parts, or, later on, in some of the results of these. A very simple instance of this is seen at puberty when the testicle is frequently tender and irritable, even to the slightest touch, or to mere chafing during walking. It may be slightly swollen and hot, or present more of the indications of inflammation. A like condition, due also to congestion of a different kind, may occur at other periods of life, especially in those who have been addicted to self-abuse, or to excessive sexual indulgence. A temporarily irritable condition of the testicle may be produced at any time, even in a healthy subject, by prolonged ungratified sexual desire. Finally these conditions of irritability and neuralgia are unknown in those whose sexual hygiene is well regulated and satisfactory.

Passing on from mere congestion to more permanent causes, the following should be remembered. A previous orchitis may have left behind it cicatricial tissue in the tunica vaginalis, the tunica albuginea,* or within the testicle itself, in which nerve ends may have become embedded, as happens occasionally in bulbous nerve ends after amputation. In a few cases a tiny collection of pus, walled in by the substance of the testicle, may be the seat of the pain, though none of the external evidence of inflammation may be present. In other cases some of these sequelæ of inflammation may bring about an irritable or neuralgic condition by interfering with the circulation and distension of the gland. The fact that the progress of atrophy is sometimes associated with a pain in the testicle has been already mentioned. And while bodies in the tunica vaginalis, free or loose, do not usually attract attention, they are occasionally the cause of much annoyance from pain, especially after tapping (p. 214).

Of the conditions met with in the epididymis which may cause an irritable or neuralgic condition, the most frequent is that nodular induration which sometimes persists after gonorrhœa in the tail (pp. 260, 267). Instead of an actual nodule, a small induration only may bring about the same condition. More rarely it has been an encysted hydrocele, the distension of which, during venereal excitement, has also led to obstruction to the escape of semen. More rarely still, the condition which provokes the pain has been a small fibro-myoma in the epididymis (Terrillon, *Congr. de Chir.*, 1885, p. 582; Méricourt, *Rev. de Méd.*, 1886).

In a similar way plugging of the vas deferens may be a cause of an irritable or neuralgic testicle. In one case in which the morbid sensibility of the testicle was associated with seminal emissions and hyperæsthesia of the prostatic urethra, Mr. Curling cured the patient by the application of silver nitrate to the prostatic urethra.

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* Dr. Parker, of Charleston, after castration for a persistent neuralgia, found the tunica albuginea ossified.

In another case of Mr. Curling's, the complaint was evidently dependent upon irritation of this part of the urethra, consequent upon an abscess in the prostate, which formed during an attack of gonorrhœa, and burst into the urethra.

Varicocele is to a varying degree another cause. As a rule it is not with the largest varicoceles, which might bring about pressure upon the spermatic nerves or some atrophy of the testis, but with varicoceles of very moderate size, with relaxed scrotal coverings, and in a hypochondriac, anxious patient, that irritable or neuralgic testicle is associated.

One more very rare cause connected with the cord is injury. Dr. P. H. Watson (*Edin. Med. Journ.*, 1866, vol. i. p. 658) relates the case of a gentleman who became entangled in machinery, one testicle being torn away and the other injured. After a while the latter became the seat of intense neuralgic pain, making life miserable. It was found during castration that the vas deferens had been severed at the time of the injury. The epididymis was converted into a condition of cystic dilatation.

Passing to another of the annexa of the testicle, the vesiculæ seminales, we find that MM. Monod and Terrillon have met with one case in which acute inflammation here was accompanied by severe pain in the corresponding testicle.

C. **Where the Lesion is quite Removed from the Testicle or its Annexa.**—This group must only be made for convenience, the irritable or neuralgic conditions must of course be due to some pressure or irritation of the nerves above. The best known example of these is renal calculus. A good instance of this lesion is given by Mr. Butlin (*Clin. Soc. Trans.*, vol. xv. p. 113), in which the patient sought relief from severe neuralgia in the right testicle, which was generally retracted and extremely tender. During the attacks he writhed and rolled about in bed. Later on it was noticed that these neuralgic attacks were associated with some lumbar pain and tenderness. Complete recovery followed on the removal of a small, prickly calcium oxalate calculus from the pelvis of the right kidney. Carcinoma of the lumbar vertebræ involving the roots of the lumbar nerves is a more occasional cause.

Disturbance of the digestive organs, oxaluria, lithiasis, and gout, have all been recorded as associated with, if not the causes of, neuralgia of the testicle.

Treatment.—The consideration of this may be divided as follows: (1) **Those cases where a known cause exists,** and

(2) **Those cases where no cause can be detected either in the genital gland and its annexa, or at a distance.** In the first group, the cause must, if possible, be removed, or, this failing, palliated. It is the second group, where no cause can be detected, which will give the most trouble, and which often remain unsatisfactory. The treatment here is, of necessity, often empirical. A well-fitting suspender; rest in the horizontal position, during the attacks; attention to the state of the rectum and large intestine; rectifying any dyspepsia or lithiasis, will all be thought of. Of more purely local remedies the injection of morphia, the use of ice * day and night for two or three days, or some such liniments as this: linim. acon. ʒij., linim. bellad. ʒij, glycer. ℥ss, on lint covered with oil silk, and worn with a suspensory bandage, may be useful. The continuous current has lately been praised by American writers. MM. Monod and Terrillon claim success in a rebellious case, one pole being placed on the scrotum and one on the lumbar region.

Very firm pressure over the cord at the level of the external ring and pubes for about fifteen minutes, with an india-rubber bandage, has been recommended by Dr. Hammond (*St. Louis Courier of Medicine*, May 1880).

Section of the nerves of the cord was recommended by Nélaton. The objections to such a course are manifold, and manifest. The delicacy of the parts involved, the difficulty of finding more than a few of the nerves, their intimate connection with the veins, the probability that a resection of some would give at best but temporary relief, are amongst them. For some of the same reasons, and on account of the vital association of these nerves with the great abdominal sympathetic centres, nerve-stretching is out of the question.

Castration has been tried in some cases, and, in a few, with success. It is probable that in these there was some local lesion which is removed at the same time as the testicle. Thus in one of Sir A. Cooper's three cases (*Testis*, p. 62), a varicocele was present; in another an orchitis had, probably, been the starting-point of the neuralgia, and had left behind it some inflammatory products such as those mentioned at p. 453, in which nerve ends had become embedded.†

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* Care must be taken, by removing the ice occasionally, to see that no gangrene of the scrotal coverings takes place. In a weakly patient especially, a layer of lint should intervene between the ice and the skin.

† Mr. Harvey Ludlow (Jacksonian Prize Essay) relates the case of a patient

The operation should never be performed save when some local lesion, which resists all well-directed treatment, is present, and when the mischief is unilateral. In all other cases the surgeon will do well to decline to operate on account of the uncertainty of the result, the possibility of the mischief returning in the scar, and above all, because of the likelihood that, especially in young subjects, the condition will disappear of itself, time at last accomplishing a cure.

Finally, it must always be remembered that here especially every case must be considered upon its merits. In cases where no cause can be found, in one the patient's mental condition and habits must be borne in mind; in another absolute continence of mind and body may be necessary for a time, and much aid may be given by the directions given at p. 472; in another, under different circumstances a happy marriage may be the patient's greatest blessing; in other cases the surgeon must look farther afield, and, perhaps, when his patient's confidence is acquired, he may find that the sickly health of a wife, or some cause of dyspareunia, may be the source of irritable testis in the husband.

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aged twenty, who had suffered for six years from neuralgia of the left testicle, which originated in an injury of the part, followed by inflammation, after the trial of various remedies without success. Mr. Stanley removed the organ. The surfaces of the tunica vaginalis were found partially adherent, the membrane being thickened; and the epididymis was changed into a firm white substance. There had been no return of pain three months after the operation.

CHAPTER XII.

MASTURBATION. CONTINENCE. SEMINAL EMISSIONS. SO-CALLED SPERMATORRHŒA. SEXUAL HYPOCHONDRIASIS. SEXUAL HYGIENE.

HIGHLY unpleasant as much of the above matter is, and not included by many writers among the diseases of which this work treats, an attempt will be made to deal with the above subjects in this place. Medical men have too much allowed themselves to form part of the "conspiracy of silence," under which this and other matters have long been tabooed, partly on account of their unsavouriness, and partly because they have feared to be likened to those unscrupulous charlatans who, in or out of our profession, have made profit from this and other, perhaps the saddest, weaknesses of man. A little later, I shall refer again to the part which medical men may and ought to take in this matter.

Masturbation in Children.—The above vice is generally looked upon as one which is to be guarded against at puberty and in adolescence. This is but partially correct. Every one who has had much to do with early childhood, especially with children who can be watched in a hospital, will have met with cases in which the habit is practised at a much earlier date. The causes in these cases are often a local irritation, such as a pruritus from an uncleanly collection of sebaceous secretion under the prepuce, intertrigo, threadworms not always limited to the bowel but sometimes met with on the perinæum, scrotum, or between the labia. Sometimes an unhealthy condition of the urine is the cause of the irritation and, as in stone, of the pulling about of the genitals. At other times the cause is an infinitely sadder one. There is no doubt whatever that the habit is first taught by untrustworthy servants, either by their practising titillation of the parts in order to quiet the child when peevish or fractious, or, for perverted sexual motives, when the child is allowed to sleep with them.

The **results** may be extremely serious, very likely life-long, for it is more than possible that this habit, if not checked, may, in weakly children, favour the onset of such conditions as tuberculosis or epilepsy. The nutrition suffers, the appetite fails or is capricious, the muscles are flabby, wasting and marked pallor follow, the temper becomes irritable and peevish; thus, the whole child is noticed to change, a fine healthy boy acquiring the aspect of premature age, and all this without any definite malady. If an operation has been performed, though the wound remains aseptic, the healing is slow, and unsatisfactory. Occasionally through the exhaustion of the nervous system the special senses suffer, and temporary failure of sight or deafness is noticed. I would lay it down as a rule that, wherever, without assignable cause, the above symptoms are noticed in a child previously known to be healthy, the effect of untimely excitement of the sexual organs is to be suspected. I prefer to express my meaning in these terms rather than by the word "masturbation," as in early life the excitement is not always practised by the hands, but by rolling on the floor or by movement of the thighs, as can be seen when the hands are fastened outside the cot.

Treatment.—I will take it for granted that the above given causes of irritation, phimosis, worms, &c., have been removed. If these simpler measures fail, the child must be most carefully watched, the hands kept fastened outside the cot, blistering fluid (liq. episp. or acet. canthar. B.P.) applied if needful to the prepuce and glans, and to the inside of the thighs. This failing, the child should be circumcised without an anæsthetic. This step acts as a warning which is long remembered; furthermore, it leads to hardening and diminished sensibility of the glans. It may be relied upon as curative, if it be supplemented by careful judicious watching. The fact must never be lost sight of that children from their age and size, and also because often they do not seek for secresy, are more easily dealt with than is the case at a later age. I do not recommend drugs such as potassium bromide, &c., at this early period of life, and warning or threatening the patients is, from my experience, quite useless.

Masturbation in Boys and Older Patients.—While here again I shall try and write shortly and succinctly, this is not a matter to be shirked. There is no need to write of the frequency of this habit, nor how it commences and spreads. A suspicion of its existence may be excited by the presence of many of the symptoms already given, and in addition, in these older patients, by languor, heaviness, a tendency to solitariness, reserve, and ypochondriasis. The brightness, openness, and moral courage, hose natural and graceful attributes of boyhood and adolescence, re lost. The mind dwelling upon one subject, and that a debasing ne, is unfitted for high thoughts and manly resolves. The patient s lowered in his own estimation by the consciousness of yielding o a secret habit, and, later on, is haunted by the thought of the nischief he has brought upon himself. If he seeks the advice of a nedical man, he shrinks from divulging the real cause of his roubles, while he excites suspicion by his roundabout expressions, vasive replies, and perhaps, his restless, fidgety manner, and nability to look his questioner in the face.

Treatment.—Before I go into any special details there are a few eneral points to be considered which have a very important bearing on the management of this matter.

I am frequently asked what is the right time to begin giving any information to the young in these matters, and how best to set about doing so. I will say at once that I am entirely opposed to those who think they can help the cultivation of purity by treating certain questions which bear upon it by the aid of anatomy and physiology. There is not so much purity in this world that we can afford to open vistas which may prove dangerously alluring to young minds, weak in judgment, and unripe for deciding between the fruit, both good and evil, which must come from the tree of knowledge. But, further, I am strongly of opinion that in questions such as these, anatomy and physiology, even if they did not harm, would fail to help. I can understand some benefit arising from teaching boys and girls the elementary physiology of the functions of respiration or digestion. The pupils here might ask themselves "Why do we breathe?" without much harm coming from it, but with another question, "How were we made?" it might be a very different matter. To put the matter briefly, if anatomy and physiology taught only what was safe on these matters, the teaching would be useless because utterly inadequate; if they taught sufficient the teaching would be dangerous. Respiration, digestion, &c., are social matters of the greatest importance. The questions that bears upon the sexual functions are also largely social, but they are much more, for they are, for young minds certainly, dangerously interwoven with moral and immoral questions also. If I am told that sexual ignorance is a dangerous thing, and that trying to maintain this only leads to more certain loss of sexual innocence, I reply that I feel the weight of the above, and am well aware that curiosity on these matters may be aroused before even boyhood. But having weighed the arguments on both sides, I am strongly of opinion that trying to impart sexual knowledge at the time of puberty, as some have advised, is a very dangerous step, and that any teaching on these matters should certainly be left to a maturer age. I hold that greater watchfulness on the part of parents and those who are *in loco parentis*, and greater carefulness in maintaining the minds and bodies of children and boys well employed, together with keeping before them the manlier, nobler, and purer elements of our nature to which youth will often respond, are far preferable to entering upon details which will undoubtedly be greedily taken in, and which by constantly recurring to young and over-curious minds, will become, too often, the starting-points of lascivious thoughts.

Thus it will be gathered that I am utterly against attempting to teach these matters to the young—*i.e.*, during boyhood. But I would not have it inferred from the above remarks that I am against these things being spoken of to boys by the proper persons. By all means let fathers or mothers give timely warnings. But let it be done (without any anatomical or physiological teaching) on some such lines as those of Squire Brown to his son before he left for Rugby. "'And now Tom, my boy,'" said the Squire, 'remember you are going, at your own earnest request, to be chucked into this great school, like a young bear, with all your troubles before you—earlier than we should have sent you perhaps. If schools are what they were in my time, you will see a great many cruel, blackguard things done, and hear a deal of foul, bad talk. But never fear, you tell the truth, keep a brave and kind heart, and never listen to or say anything you wouldn't have your mother or sister hear, and you'll never feel ashamed to come home or we to see you.' The Squire's last words . . . . . had been the result of much anxious thought. . . . . To condense his meditation it was somewhat as follows: "I won't tell him to read his Bible and to love God; if he don't do that for his mother's sake and teaching, he won't for mine. Shall I go into the sort of temptation he'll meet with? No, I can't do that. Never do for an old fellow to go into such things with a boy. He won't understand me. Do him more harm than good, ten to one." With young men it is a totally different matter. Here, whether by addresses, by printed leaflets, or by quiet talks, masters and medical men, especially those attached to a school, may do infinite good.

Another point which I would strongly urge upon teachers when advising upon these matters and the temptations associated with them, and also upon the surgeon when a patient comes in gloom or mental distress because he has given way to self-abuse, is that they should all try and free these matters from the mystery with which they have been shrouded, and from the disgusting character which has been given them. The matter, because painful and disgusting, has been considered an especial wickedness, a way of looking at it which I believe to be most unfair to boys, as this branding the habit with a special mark is soon known to those who have begun to practise it, and makes them feel that they are shut out from all sympathy for their weakness. I wish it to be understood that I am now speaking only of boys. It is not for a moment intended to palliate, in the slightest degree, or to make light of the unmanliness or self-degradation entailed by the practice when once this is habitual. The way in which this subject has been tabooed by all has brought about most pernicious results. Until the profession take the lead in putting these matters in a proper light, parents and schoolmasters will look upon children and boys who have fallen into the habit only with disgust, and will always try to conceal and hush up the matter whenever it comes to the surface; while the subjects of it, who might have been broken of the habit if it had been looked upon at the first as a failing which is to be treated on common-sense grounds, and not as a hopeless moral degradation, are left to sink lower and lower, and, perhaps, to fall later into the clutches of those vampires which prey upon this, which is almost the saddest weakness of man. The time has come when what is rather a sickly sentimentalism than a true refinement should be laid aside. Boys should be warned of what they will be liable to see and hear; they should be taught—and I think this can be done without the aid of anatomy and physiology, and without any detail—that sexual feelings are part of our nature, and it should be pointed out to them how these, which there is no ignoring or escaping, can be controlled, or, still better, escaped from (*note* p. 464). Too often, however, the boy is left to find out his knowledge from others, and in undesirable ways; and happy is he, if before it is too late, he finds in his master or medical man a friendly and judicious adviser. I am firmly persuaded that if parents, and those who are *in loco parentis*, would take a healthier view of the sexual instincts, and by this I mean would be more willing to call to their aid physical as well as moral and religious agencies, we as medical men should see much less of the results of the sensual passions.

Having spoken of certain preliminary points, I now turn to those more directly concerned in the treatment. The great thing of all others is to keep boys wisely employed in mind and body. If it be possible, as it undoubtedly is, for adults who desire to avoid sexual temptations, to render themselves temporarily impotent by devoting themselves, with their whole heart and soul, to athletics and study, it must be far easier to keep out of evil boys whose sexual fires are not yet burning strongly, and who can be more easily controlled in their indoor and open-air pursuits. And with regard to the latter, in some form or other, they should be rigorously enforced. I say in some form or other advisedly, because the old English system of having but two main games, cricket and football, is largely responsible for some boys going wrong. At a large school there must always be boys who will try and shirk these games, and who, when forced to play, do so unwillingly and half-heartedly. For such, alternatives should be provided. The masters who are unable to do this are scarcely fit to have the charge of boys. As in any large school there are different groups of boys, so different forms of out-door exercise should be provided, and when provided should be enforced. In addition to the ordinary ones of cricket, football, fives, &c., the opportunities of paper-chases, making collections of wild flowers, and such like, should be provided. Many other instances will occur to those familiar with school life and boys' needs. But in some way or other it should be ensured that every boy should have the opportunity of being healthily weary at the day's close, and, what is more, should have used this opportunity. There are many other points with which I have no space to deal in a work like this. They will readily occur to the mind of every thoughtful master. I refer to the jealously guarding, and restricting the privileges of separate studies, the watching over friendships between a certain class of boys (generally of effeminate appearance), and those much older, friendships, which because they can lift boys upwards, may also drag them down to hell.* I would warn masters that it is when a school is most prosperous, when it is most sought after, that much vigilance is required. Finally, it is never well to tax a boy who is suspected of this habit. The usual result will be a falsehood, and thus a further loss of his self-respect. Such boys are much to be pitied, but they should never be allowed to think themselves despised.

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* Two more, most important points, can only be mentioned. Of one, though summed up in four words, "Look to your præfects," every old public schoolboy will know the importance, and recognise my meaning. The other consists in emphasising the need of prompt and regular removal of those who are likely to taint the flock. This can always be done by other means, and on other grounds, than those involved by expulsion.

CONTINENCE. SEMINAL EMISSIONS.

Having spoken of masturbation in children and boys, I shall consider the above two most important headings together. We are very frequently called upon to treat **seminal emissions**, especially in those who are practising continency, and, in giving our advice, we have to consider other questions of vital importance to the young adult.

And first and foremost arises the question often put to me, whether it is possible for a man to live strictly continently, and yet to keep in health. I will quote on this point the words of Sir J. Paget (*Clin. Lect. and Essays*, p. 286): "Many of your patients will ask you about sexual intercourse, and some will expect you to prescribe fornication. I would just as soon prescribe theft or lying, or anything else that God has forbidden. If men will practise fornication or uncleanness it must be of their own choice and on their sole responsibility. We are not to prescribe that which is morally wrong, even if we have some reason to think that the patient's health would be better for the wrong-doing. But in the cases before us, and I can imagine none in which I should think differently, there is not ground for so much as raising a question about the wrong-doing. Chastity does no harm to mind or body, its discipline is excellent, marriage can be safely waited for, and among the many nervous and hypochondriacal patients who have talked to me about fornication, I have never heard one say that he was better or happier after it; several have said that they were worse; and many, having failed, have been made much worse." More recently Dr. Gowers has uttered equally noble words (*Brit. Med. Journ.*, 1889, vol. i. p. 348): "Do we all we can, and our profession gives us power that no other has—do we all we can to promote that perfect chastity which alone has power to save from this, and from that which is worse? The opinions that on pseudo-physiological grounds suggest or permit incontinence are absolutely false. Trace them to their ultimate basis, and they are groundless. They rest only on sensory illusions—one of the many illustrations of a maxim I have often to enforce on various sufferers: 'There are no liars like our own sensations.' Or rather I should say, they rest on misinterpretations, always biassed, and often deliberate. With all the force that any knowledge I possess can give, with any authority I may have, as the result of long observation and consideration of the subject in all its relations, I assert that no man ever yet was in the slightest degree or way the worse for perfect continence or the better for incontinence, that for unchastity every man must be the worse morally, and that most are worse physically; and that in no small number the result is, and ever will be, utter physical shipwreck on one of the many rocks, sharp and jagged-edged, or one of the many banks of festering slime that are about his course, and which no care can possibly avoid. My warning is: Let us beware lest we give even a silent sanction to that against which I am sure, on even the lowest grounds that we can take, we should resolutely set our face and raise our voice."

Medical men may well feel their hands strengthened by such words from the leaders of our profession when they have to advise in these matters, and when they have to answer patients who complain that continence, if persevered with, after a time upsets them, prevents their working, renders them "unfit for anything." Now at first sight there is much truth in this. In many cases the struggle to keep down the sexual fires is attended at first with real distress. The patient's mind is rendered irritable, working, especially in the sedentary position, becomes impossible, and, if he persists in attempting to continue his work, he is often further baffled by sexual thoughts and images crowding into his mind. Young men in all the early prime of life often suffer really keen distress, and we medical men cannot be surprised that in conversation amongst themselves, and occasionally with us, they are found to declare that, after facing for a while these struggles, they have yielded, and that sexual intercourse has done them good both in bodily and mental power. The fallacies here are obvious, the answer ready to hand, though there are many to whom it is waste of time to point out the one, or to make the other. The trial is usually made needlessly harder because it is faced, not fled from.* Of those who win their way to strict continence during their unmarried life, a few do so because they can command their thoughts by a strong effort of the will, and can determinately apply their minds to other subjects, but the majority win their way out of the distress of which I have spoken by remembering that this is the only warfare where victory is won by flight. Those who come complaining of the restlessness and irritability produced by continence, and hope that the medical man will prescribe the remedy which they desire, are more eager to find an excuse in the sternness of the struggle to justify their indulging their sexual desires, than they are earnest in endeavouring to control them. Such, before they yield, their medical adviser should earnestly urge to make a trial of the treatment given below. Better than any one else, he can explain how it is that it is the half continent who are subject to this constant irritability of the sexual organs, and that it is they who from unshunned excitement must suffer from an excess of seminal secretion and its results. On the other hand, it is the strictly continent men who keep themselves healthily occupied in mind and body, men who when attacked by imperious sexual desire simply sally out, and seek, in exercise, a change of surroundings, to such as these the secretion of semen is soon only sufficient to be easily got rid of by a nocturnal emission once or twice a month, a state of things which is perfectly natural. The medical man, in advising on these points, has a knowledge, which none others have, of the arrangements to which I have alluded at p. 20, by which excessive secretion of seminal fluid is naturally prevented.

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* "Contra libidinis impetum apprehende fugam, si vis obtinere victoriam:" St. Augustine.

Another argument against continence which may be brought forward by patients—viz., that a man can only keep his sexual organs healthy by using them regularly—is based on a false analogy. This argument was long ago answered by Sir G. Humphry in the following words (*Syst. of Surg.*, vol. iii. p. 549): "There are no organs so much under control as those of generation. Their functions are neither directly nor indirectly in the least essential to life, scarcely even to the well-being of the body; indeed, which is more remarkable and unusual, they are scarcely essential to the maintenance of the structure of the organs themselves in perfect integrity. The functions of the testicle, like those of the mammary gland and the uterus, may be suspended for a long period, possibly for life, and yet its structure may be sound and capable of being roused into activity. In this respect its qualities peculiarly adapt it to subserviency to man's moral nature. Not that it yields a tame or easy submission. By no means. The stern struggle between the moral and the physical is one of man's greatest trials—a trial which it may be presumption voluntarily to encounter, yet a trial which is, at some time or other, laid upon most men; and it is some satisfaction to know, that if the victory be with the moral, it is not necessarily at the expense of the physical."

Nocturnal Seminal Emissions.

The surgeon is frequently consulted about these. Their occasional recurrence in chaste, healthy men is perfectly natural, and is to be looked upon as a normal safety-valve for the escape of any seminal fluid which is in excess of the demand, and the patient may be honestly assured to that effect, but when the emissions return more than once a fortnight, and especially if they amount to two or three in a week, they should receive attention. They occur especially in young men of sedentary and studious habits, especially if these live well, and, above all, if, with days so spent, they allow their minds to be filled with sexual matters.

The troubles which over-frequent seminal emissions may bring about are well summed up in Sir J. Paget's words (*loc. supra cit.* p. 277): "Aching of the back and lower limbs, readiness to be fatigued, and in all fatigue pain; weary limbs and spines; indisposition or seeming incapacity for mental exercise; defect of will and of power of attention; often restlessness at night and unrefreshing sleep; hysteric fits or feelings. Many patients, too, are troubled with palpitation; many with constipation; some with excess of lithates; some with oxalates in their urine; not a few with irritable bladder; some with various nervous indigestions; some with coldness of feet and hands."

Treatment.—This will be given under the following section, p. 470.

SO-CALLED SPERMATORRHŒA. SEXUAL HYPOCHONDRIASIS. SEXUAL HYGIENE.

The term "**spermatorrhœa,**" passed on from writer to writer, has been extremely abused, and should be done away with. Patients who come and use it mean thereby that they are suffering from a frequent escape of seminal fluid, without their being able to control it, and often without their being aware of it. In ninety-nine out of a hundred cases there is nothing of the sort. The conditions really present to which patients apply the above term are usually one of the following: (1) Nocturnal seminal emissions, which, as shown above, are always to be explained, and are often natural. (2) Escape of a little clear mucus usually from the prostatic urethra, and which almost always is preceded by some degree of sexual excitement and congestion of the prostate. This mucus, as a rule, contains no spermatozoa whatever, but, though clear when seen at the meatus, it often deposits, when brought by an alarmed patient in his urine or in water, little threads and shreds and flocculi which are merely inspissated mucus or tiny epithelial masses. (3) The fluid passed and taken for semen may be only a gleety discharge due to a stricture or some inflamed patch on the floor of the urethra. (4) and (5) Lastly, the term has even been applied to the natural flocculent cloud of mucus which soon makes its appearance at the bottom of healthy urine, or to the milky turbid deposit of phosphates or pale lithates which may present themselves in the urine of the jaded.

Apart from venereal excitement, fluid containing semen can only escape when the contents of the vesiculæ seminales which happen to be loaded are pressed out during defæcation, especially when there is much straining with solid stools, or when a specimen of urine is examined which has washed out any seminal fluid which may have remained in the urethra after an emission or coitus. The above is a rule to which the exceptions are infinitely rare. But when by repeated venereal excitement, and especially after long-continued and frequent self-abuse, an irritable, weakened, and atonic condition of the vesiculæ seminales, ejaculatory ducts, and prostate is brought about, emissions of seminal fluid (not always containing spermatozoa) are likely to occur frequently and with very slight provocation. But this state of things should be called by its proper name—frequent seminal emissions and their results—and not by the much-abused and inaccurate term, spermatorrhœa. This name is, in every respect, a bad one. It is a bad one because, thanks to writers like Lallemand, and others also, have too quickly copied his over-coloured picture, and thanks also to the too cursory way in which the subject has been treated by most of our great surgical writers, this word spermatorrhœa has become to the public a term of terror, and yet of mystery, implying, as it does to them, obscure "nervous debility," insidious in its origin and certainly disastrous in its ending. It is even a worse term, not only because it is thus abused by the public, but because it has become a source of ill-gotten gain to many a cheat and charlatan. But it is most of all objectionable because no such condition, as usually understood by it, exists. And it is for this reason that I have not alluded to those cases, supposed to be typical of spermatorrhœa, which have been painted in such lurid colours by Lallemand * (*Des Pertes Séminales Involontaires*).

Apart from nocturnal emissions, there is no such thing as frequent escape of seminal fluid without the patient being aware of it. Mucus oozing from the urethra there may be, as has been pointed out (p. 467) of different kinds; hasty premature ejaculations may take place, with imperfect erections and without the usual voluptuous sensations, especially in those who have habitually kept their genital organs irritable, by constant sexual excitement of body and mind. Both these conditions may be met with, both are undoubtedly of importance, but they do not authorise the use of a term which is mischievous in many ways. The sooner surgeons drop it altogether, and speak only of conditions which actually exist, such as seminal emissions, irritability of the sexual organs, &c., the more dignified will it be for themselves and the better for the public.

Sexual Hypochondriasis.

By this term Sir J. Paget means "cases of male patients who regard trivial maladies, or even some of the natural events in their sexual organs, with the unreasonable dread or gloom and watchfulness which are characteristic of hypochondriasis." In treating these cases the practitioner will do well to remember that the following are often here combined—viz., (α) Some sexual disturbance past or present, often largely imaginary; (β) a neurotic element often forming a large factor in the case; (γ) dyspepsia or other evidence of unhealthy daily life.

Of these three factors many instances of the first (α) some sexual disturbances, past or present, often largely imaginary, have been already given. Such is the supposed "spermatorrhœa" or passage of semen in the urine or at stool (p. 467). The passage of flakes or threads of mucus in the urine is another (p. 467). A third is the escape of clear mucus from the urethra. A fourth is a varicocele. In Sir J. Paget's words: "There are some to whom, whether through ignorance or misguidance, or hypochondriasis, a varicocele is a source of misery and dismay. They look on it as a forerunner of impotence, and of wasting testicles and I know not what besides. All such fears are groundless." Other local sexual conditions, largely imaginary but powerful to disturb weak minds, are a too pendulous scrotum, a shrivelled, flaccid, or cold state of the genitals, or testicles supposed to be too small when they are really of normal size.

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* The following is Sir J. Paget's opinion on this matter (*loc. supra cit.*, p. 288): First amongst these false teachers is Lallemand. His picture of spermatorrhœa in its complete form is a description of something which I believe to be unknown amongst Englishmen. It may be that there is no such disease in France; a wild imagination may have suggested it, but, whether it be found in France or not, I believe that you will never see it here. I have not yet seen any of the worst cases which Lallemand describes, nor any which would justify the general tone of his description. To many others, with as good opportunities as myself for seeing rare and severe cases, they are completely unknown; and I observe that English writers on this subject, when they wish to tell the worst things to which spermatorrhœa can be said to lead, speak, not from their own observations, but from what they believe to have been Lallemand's.

(β) The second and often a large factor in the case is the neurotic element. The fact is that, putting aside results such as chorea, epilepsy, idiocy, insanity—the relations of which to sexual excesses, especially masturbation, have perhaps been exaggerated—many of those who grow up unable to throw off the habits by which they become enslaved, are from the first, if not mentally deficient, at least mentally weak. They are often unsound and feeble in nervous system altogether, they are certainly unsound and feeble in that part of it which relates to their sexual system. Nothing shows this more clearly than the way in which the morbid minds of many of them dwell upon some *maladie imaginaire*, whether self-abuse of earlier days, or one of the local conditions mentioned above, clinging to them in spite of all proof of their unreality, clothing them with fancied importance and terrors, until these hypochondriacs become a pestilent nuisance to themselves and others.

(γ) The third factor often present is dyspepsia and other evidence of unhealthy daily life. I cannot do better than call the attention of my readers to the following words of the late Mr. Gascoyen, in which it is most clearly shown that so-called spermatorrhœa and sexual hypochondriasis are largely made up of sexual irritability, mental weakness, uneasiness or disease:

"It is not uncommon to be told by a patient of imperfect erection or even its complete absence, with too rapid ejaculation of semen when attempting intercourse, occasioning not only great disappointment and annoyance, but also the most serious apprehension that he is losing, or has lost, his virile power. The knowledge that there is a possibility of failure, together with the shame and vexation of such an occurrence, add much to the probability of non-success when again trial is made; and the loss of confidence then engendered may really result in a functional impotency, though the structural capacity is adequate for the purpose.

"When such a condition happens to a patient who at some period of his life has indulged in sexual excess or self-abuse—even though many years have elapsed since he practised these habits, and then only for a short period and to a limited extent—he is certain to connect it with his former indiscretions, and to believe that he is permanently injured by them. Or, if it occur to a man who has never in any way abused his sexual power, he will call to mind that in days gone by he occasionally had seminal emissions, and will attribute his failure to this cause, regarding it as evidence of debility, or some defect in his reproductive organs. When once such an idea has crept into his mind, every sensation is eagerly watched for; and the slightest nervous twinge or the least feeling of discomfort in these parts, which formerly would have passed unnoticed, is set down to some abnormal cause.

"Constant mental uneasiness soon produces derangement of the digestive organs, heartburn, flatulence, sense of oppression in the epigastrium, swimming of the head, shortness of the breath, loss of appetite, constipation; occasional muscular pains, feeling of general debility, aching of the limbs and especially of the back, beset the unhappy man, until he believes that he is suffering from the effect of spermatorrhœa, the result of his former imprudence. The more he torments himself about this, the more urgent became his dyspeptic troubles; and unless treated, he gradually sinks into a state of hypochondriasis, passing his time in noting his symptoms, and brooding over them, to the exclusion of almost every other subject. The pain in his loins he attributes to disease of his kidneys, or of the spinal marrow; the occasional shooting sensations through the body and limbs to a grave disease of his nervous system; the feeling of oppression in his head, his forgetfulness and mental inactivity, to approaching loss of intellect. He becomes the prey of the most depressing thoughts, and entertains the firm conviction that his condition is incurable, and that idiocy or insanity is staring him in the face, until at length he falls into a slough of despond, from which it is very difficult to extricate him."

Treatment.—In cases of so-called spermatorrhœa and sexual hypochondriasis, the treatment must be shaped on lines which will meet the three factors above mentioned—viz., the sexual element, the neurotic element, and that of unhealthy hygiene. Success, with regard to the first two, will vary much according to the weakness or strength of the patient's nervous system, the condition of his mind, and the character of his habits. Thus, Sir J. Paget, in that essay to which reference has been already made, writes as follows: "A sensible man, who has been only ignorant on sexual subjects, who can understand evidence, and is ready to believe those who are most likely to tell him what is true, will be cured when the truth is told. At the opposite extreme the worst of the hypochondriacs will be almost incapable of cure; they will believe nothing hopeful; they will be dull to all common-sense statements; many of them will prefer to be guided by rogues rather than by honest men. Between these extremes you will have various degrees of success; and in the vast majority of cases time does good. Some few patients, whose hypochondriasis is a form of inherited insanity, become plainly insane; some, though they marry, and have duly regulated sexual intercourse, and may cease to have involuntary emissions, yet retain their other nervous symptoms, and continue hypochondriacal; but the vast majority get well. Some fall in love, marry, and are cured; some, getting into the weighty responsibilities of life, have things to think about more important than their sexual organs; and in all, as they grow older, the spinal marrow becomes less irritable, so that the emissions become less frequent, and are attended with less feeling of exhaustion."

More special directions must be left in great measure to the common sense of the surgeon. Drugs are only of use indirectly, and of these tonics come before sedatives. Of the former, there is nothing better than one of the following: A mixture containing liquor strychniæ, dilute phosphoric acid and calumba; Easton's or Fellows' syrup; tincture of perchloride of iron and nux vomica; given three times a day. Of sedatives a pill containing one-third or one-fourth of belladonna extract, and 2 or 3 gr. of camphor, or one-fiftieth gr. of atropine, may be given at night; or these failing, potassium bromide and hyoscyamus may be given, but the lowering effect of the former drug, and the fact that it may bring out troublesome crops of boils, must always be remembered. Antipyrin has been recommended of late years for nocturnal seminal emissions, but I have no personal experience of it. While I admit that drugs may occasionally be useful, and that indigestion, palpitation, &c., may require appropriate medicinal treatment, I am strongly of opinion that against these, as with sleeplessness, it is far best to operate by enforcing matters of common-sense hygiene rather than by recommending drugs, for the latter keep up the idea of invalidism, and lead the patient into an unwise feeling of reliance upon measures which cannot go to the root of the matter.

Far better than all drugs are the giving up of sedentary habits, relaxation from overwork or excessive reading, change of air, travelling, seaside or country residence, or where the two latter cannot be obtained, athletic sports or open-air pursuits of some kind or other, a plain unstimulating diet, going to bed weary and getting up when first awaking in the morning.* The regular morning bath, chilled at first if need be, then cold, is to be recommended. A warm bath before going to bed is, from its tendency to produce a vascular and relaxed condition of the genitals, equally unadvisable. Sponging the parts in cold water, followed by friction and the general use of the flesh-brush, is far preferable for giving tone.

The common sense of the medical man will supply the directions needed to suit each case. As, above all, sexual thoughts and images are to be avoided, the body and mind must be kept thoroughly occupied, while not overtaxed.† For many the ordinary games of cricket, football, lawn-tennis, and golfing will suffice. Others will be attracted by bicycling,‡ volunteering, boating. To those who can afford it, an ocean trip on one of the steamers advertised from time to time, or a Cook's tourist ticket, may supply the break and change that are needed, though the high living and difficulty of getting active exercise may be here serious drawbacks. The student of medicine or law who complains that he can never get any exercise save on Saturday afternoon, can easily, if he choose, make up for this by living out of town and walking part of the way, instead of coming in by train. Those obliged to live in town can walk to their work, and join a gymnasium. If the will be but firm and earnest, a way will be found.

Some measures of a more local character remain to be mentioned. Such are the removal of a long, or the slitting up of a tight, prepuce thus preventing the irritation of retained secretion. The bladder should be kept empty at night, very little fluid being drunk after

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* Never perhaps more tersely put than in Plutarch's words, "Hard marches all night and a small breakfast next day, νυκτοπορίαν καὶ ὀλιγαριστίαν." Plutarch, *Apoph.*, p. 180.

† No words can sum this up better than those in the heathen philosophy of Ovid, "Remedia Amoris," 143:

> "Venus otia amat. Qui finem quæris amoris,
> Cedit amor rebus; res age, tutus eris."

For the following free but happy translation I am indebted to an old dresser, and friend:

> "Lust loves laziness. Thou that wouldst be free
> Be up and doing! Safe thou then shall be." (The Sage.)

Many of the present generation of Guy's men (1892) will recognise the translator under the pseudonym, and while they admire the felicitous rendering of "res age," so characteristic of the man, will say, with me, "O si sic omnes!"

Care must be taken that the saddle does not press upon the perinæum.

7 P.M. It should always be emptied at the close of the first sleep, these precautions preventing that turgescence of the prostate, and, so, of the erectile tissue of the penis which is so common in the early morning, and especially to be deprecated in patients who are liable to emissions. If the patient habitually sleeps on his back, some simple mechanical means may be adopted to break this habit. Soft-lying and over-covering with bedclothes should be avoided. The bowels should, of course, be attended to, the chief meal should be over by 2 P.M., and the last meal, of a light and digestible kind, by 7 P.M. Meat and alcohol must be sparingly taken.

The advantage of local treatment directed to the prostatic urethra has been a good deal disputed. But where there is evidence of local irritability here, as shown by a frequent call to empty the bladder, tenderness and feeling of heat complained of deep in the perinæum, and by the passage of a catheter, however gentle, causing pain and perhaps spasmodic contraction as soon as it reaches the prostatic urethra, the careful use of a full-sized steel sound or of a solution of silver nitrate is often attended with excellent results. For this purpose I much prefer the syringe-catheter as recommended by Mr. Erichsen (*Surgery*, 7th ed. vol. ii. p. 976), to the porte-caustique and the use of the solid salt as advised by Lallemand and others. The syringe-catheter consists of a silver catheter with a number of small openings near its end. A small piece of sponge is fixed inside to the end of a stylet. The sponge having been soaked in a solution of silver nitrate (gr. v–℥j), and the stylet replaced, the instrument, well oiled, is passed as far as the prostatic urethra, a point previously determined by the passage of a catheter. Where the stronger solutions (gr. xx–℥j) or the solid caustic are used, a good deal of smarting, some scalding on micturition, and a slight bloody or purulent discharge may follow. As this irritation may amount to violent pain, retention and even perinæal abscess,[*] and as the use of the solid caustic is uncertain from the difficulty of applying it exactly where it is wanted, I much prefer the milder solution to begin with. After its use the patient should take one or two warm baths, should abstain from much exercise, and should only take bland drinks. The application should not be repeated oftener than once in a week or ten days, and should not be used on more than two or three occasions, as by this time any benefit that is likely to follow will have appeared; finally, it should only be used for those cases where other treatment has failed and where there is reason for honestly believing that local irritation exists, keeping up a tendency to premature ejaculation in coitus, or over-frequent seminal emission.

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[*] Mr. Curling, *loc. supra cit.*, p. 500, preferred the solid caustic, but he admitted that in two or three cases slight stricture resulted, but yielded readily to dilatation.

In cases where we are warranted in considering this fact to be at fault, we are justified in applying to it that salt which is so often found to allay irritability or a chronic inflammatory condition in other mucous membranes. Patients must always be made to understand, clearly, that this mode of treatment, like that of blistering the prepuce, and still more that of giving sedatives for which they often ask, will be utterly useless unless, from the desire of a higher manliness, they earnestly endeavour to shake off evil habits, and to fill their minds with worthier things.

There is one other matter which must never be lost sight of in the treatment of so-called spermatorrhœa and sexual hypochondriasis, and that is, how far these are the result of sexual irritability first noticed at the time of puberty, and which, fostered and increased by evil teaching, leads on to sexual excesses of some kind, and so to exhaustion of the nervous system.

According to others the nervous system is primarily at fault in bringing about this condition of sexual neurasthenia. Trousseau (*Clin. Lect.*, vol. iii.), who held this latter view, based his belief on the following arguments. The subjects of seminal emissions, "spermatorrhœa," &c., have usually suffered also from nocturnal incontinence of urine, a disorder in which one of the spinal centres plays an important part. If their family history be inquired into, it will often be found that relations have suffered from epilepsy, insanity, hypochondriasis, or locomotor ataxy. Another argument put forward is, that inasmuch as a young man may without any bad consequence accomplish coitus three or four times a week, it may be assumed that if another young man, who has involuntary seminal emissions three or four times a week, has also very serious nervous symptoms, the latter are not caused by the loss of semen. Briefly stated, Prof. Trousseau's opinion came to this, that it is not "spermatorrhœa" which brings about a weakened state of the nervous system but it is some morbid state of the nervous system which predisposes to "spermatorrhœa," and that "spermatorrhœa" peculiarly aggravates the nervous affection which is the primary source of the evil.

I have no space to discuss this view at length, but I consider the doctrine which places these sexual disturbances at the door of a weakened nervous system an extremely dangerous one, and one which will gravely hamper medical men in any endeavour to put these matters on a higher and worthier footing. I would go further and express my belief that the doctrine is not only a dangerous one, furnishing, as it may, excuses and palliation to a class of minds weak enough already, but an incorrect one as well. To consider for a moment the arguments on which it is based. Are we justified in saying that because in early boyhood the spinal centres, and amongst them the vesical, have partaken of the restlessness of childhood, and nocturnal incontinence has been the result, when the same patient is older his nervous system will necessarily be weakly and irritable, and that this explains (it will soon be excuse) his liability to sexual excitement, nocturnal emissions, &c.? As to the evidence of other neuroses and a weakened nervous system which Prof. Trousseau thought he obtained from the family history, this, if merely taken down as reported, and not backed up by accurate and painstaking investigation, is notoriously inadequate. As to the argument derived from the comparison between nocturnal emissions and sexual intercourse, an obvious fallacy is evident in one of the premises here. Further, no notice is taken of the effect upon many minds of seminal emissions, the exaggerated terror of their power to weaken, and, in some, the horror and disgust at their occurrence. As further showing the mistake of thinking that the mere loss of seminal fluid is the cause of the debility which may follow frequent nocturnal emissions, we know little about dreams, and especially erotic ones. It does not follow that because the result of a dream, or the awakening from it, has been momentary, that the share the nervous system has taken in it has been momentary also.

Two other matters require mention before the treatment of these matters is dismissed.

The question of marriage is sometimes raised by patients who suffer from sexual emissions and their sequelæ. Where there is much local irritability, where the emissions occur frequently, where the bodily health is poor, and the condition of the mind one of gloom and depression, such a step cannot of course be sanctioned, as the fruitless attempts at coitus will only increase the local irritation, and still more impair the general health, while the certain failures will intensify the mental misery. Moreover, it is not the health and happiness of one person only that will be affected under these conditions. A wife is not to be looked upon as a mere therapeutical agent. When the condition of the mind and body is improved, congenial marriage is likely to be beneficial, as it promotes the maintenance of healthy sexual hygiene.

The operation of castration has been sometimes performed in cases where emissions, great sexual excitement, or so called "spermatorrhœa," appear to be leading on to insanity, or to be the cause of epilepsy. The operation is occasionally successful, but more often, as in Mr. Holthouse's case, alluded to below, it does no good. It should be remembered, with reference to the operation in these and similar cases, that the fluid emitted is not formed altogether in the testes, but merely acquires its fecundating qualities from the portion they secrete: thus, the immediate object intended by the operation—the prevention of emissions—is really not effected in many instances, at any rate for some time after the operation. Thus it has been found that the emissions may continue and be as prejudicial as before, although there be little or no semen in the fluid ejaculated.

This treatment has been largely tried in America. Dr. Bell's words (*Boston Med. Journ.*, vol. lxi. p. 166) give an idea of the effect of the operation in these and the allied cases for which it has been proposed. "I have often been consulted as to tying the spermatic arteries, the vasa deferentia and removal of the testis, in the forms of insanity connected with spermatorrhœa. I have known it done repeatedly. In one case Dr. —— castrated a clean-gone onanist, who subsequently rallied and became an active man. In a case of self-perpetrated castration under a similar state of mind, entire restoration to peace of mind and energy were produced. On the other hand, in all the lunatic-hospital cases where I have known it done, no valuable results have followed. At the Ohio hospital, some years ago, it was tried on quite an extensive scale. No case of improvement followed, indeed Dr. Awl told me that in one patient, who previously was quiet and contented, a permanent and dangerous condition of irritability followed. Dr. Goodwin reports (*Journ. Amer. Med. Assoc.*, 1888) a case in which castration was performed at the earnest solicitation of the patient for the cure of masturbation. Erections continued, and masturbation was practised, just as before the operation. Dr. R. Battey, of Georgia (*ibidem*) reports a similar case. Both reports are closed too soon. Van Buren (*Surg. Dis. of the Genito-Urinary Organs*, p. 458) records a case in which a portion of each vas deferens was excised in a young lad whose intellect was beginning to fail from habitual masturbation. The operation was of no advantage: though the testicles both went on to atrophy, the habit was persisted with, and idiocy became complete.*

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* A case is recorded (*Lancet*, 1856, vol. ii. p. 215) in which double castration

The late Dr. Bacon, on the other hand, stated his belief (*Epileptic Insanity*, June 1869) that, as in seven out of every ten cases of chronic epilepsy in the male, the genital organs are the great source of excitation, usually kept up by bad habits, castration is the only effective mode of quieting this state, and so alleviating the epilepsy and improving the mental condition in some cases, though in others careful supervision and treatment may do much good. Dr. Bacon related the case of a lad, aged eighteen, in which the operation was followed by marked improvement in health and intelligence, and diminution and cessation of the fits; eighteen months after the operation the improvement had continued, and since the operation the fits had not recurred with more than a fifth of their former frequency. In another case, that of an idiot, aged sixteen, with marked sexual excitement, and very frequent masturbation, the removal of the testes eighteen months before had been followed by great improvement in these respects.

Thus, when insanity is threatening, the operation is justifiable, but of doubtful efficacy; and the same may be said of epilepsy, if it is quite clear that sexual excitement is really the cause. In other cases, however strongly the operation is solicited by the patient, no surgeon is justified in yielding to a patient who "cannot will," nor "in complying with the unreasonable wishes of a monomaniac" (Curling).

If the operation be performed for insanity or epilepsy, the surgeon should provide himself with a written statement from the friends showing that they have had the question put before them in all its bearings, and that they accept the uncertainty of the result.

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was performed for "spermatorrhœa." After a few weeks the emissions returned, and only "eventually disappeared, under a course of issues in the perinæum, applied with the purpose of removing the overaction of the vesiculæ seminales"!

CHAPTER XIII.

IMPOTENCE. STERILITY.

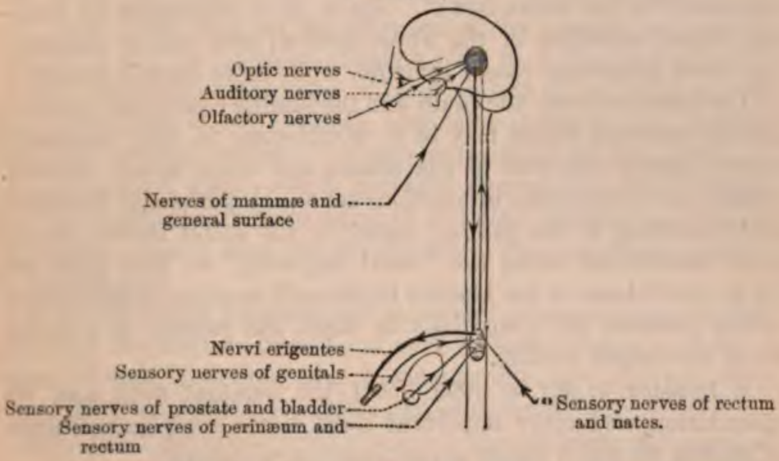
The normal, complete generative act in the male includes two parts: first, copulation, which depends upon a perfect erection of the penis, and secondly, an ejaculation of fertile semen into the vagina. If therefore the capacity for copulation be wanting, the patient will be impotent, and of course sterile also. Sterility, on the other hand, not only does not include impotence, but is often met with in those who are vigorous in intercourse, and who ejaculate a fluid which, without microscopical examination, presents all the properties of normal semen. Hence it is difficult for these patients to realise that they are the cause of barren marriages (Gross). And herein lies a very important point with regard to sterility in the male, as apart from impotence. Mr. Curling long ago drew attention (*lib. cit.*, p. 445) to the fact that in women who are ready for conception, frequent sexual excitement without impregnation may prove very injurious to health, by leading to chronic ovarian irritation, uterine congestion, hæmorrhage, &c.

While the above distinction between impotence or the inability to copulate, and sterility or the inability to beget children, should be adhered to as strictly as possible, it will be found in practice that other conditions, such as absence of venereal desire, are occasionally present, and that sometimes the two, impotence and sterility, run very closely to each other.

The causes of impotence and sterility are extremely numerous, and may arise out of some fault in any one of the complicated series of conditions which, like links in a chain, are necessary for the due performance of the act, partly voluntary and partly reflex, of sexual intercourse. For a comprehension of the pathology of these causes of impotence and sterility a knowledge of the **physiology of normal erection, and of the more important points in the formation and ejaculation of the seminal fluid are essential.**

Erection depends upon the reflex excitement, through a centre situated in the lumbar enlargement of certain nerves of the sacral plexus (probably the second, third, and fourth)—" nervi erigentes " of Eckhardt—containing the vaso-dilator fibres of the vascular system of the penis, which causes relaxation of the vessels and an influx of blood into the arterioles of the erectile tissue. It is also in part due to, or strengthened by, obstruction to the outflow of blood in the dorsal vein, brought about by contraction of the anterior fibres of the accelerator urinæ. Besides the existence of this genital centre in the lumbar cord and its connection with the sacral nerves, there are fibres passing upwards to the brain, the exact termination of which is unknown. Along some of the fibres pass the impulses due to sexual thoughts. Eckhardt proved the existence of these fibres when he showed that by electrical stimulation of the crura, pons, and upper cervical region of the cord, distinct erection of the penis could be produced. By other fibres passing from the cerebral to the lumbar centre the reflex act, which constitutes erection, may be inhibited from the brain.

FIG. 67.


Optic nerves
Auditory nerves
Olfactory nerves
Nerves of mammæ and general surface
Nervi erigentes
Sensory nerves of genitals
Sensory nerves of prostate and bladder
Sensory nerves of perinæum and rectum
Sensory nerves of rectum and nates.

The darkly-shaded spot indicates the genital centre in the brain, and the lighter spot the spinal centre in the lumbar cord. The direction in which the impulses are conveyed are indicated by the arrows. (Lauder Brunton.)

As an **outcome** of the **above physiological facts** we find the following **practical results.** While the influence of the brain in producing erection is evoked by sexual thoughts, or by sight, it is arrested or removed by vigorous mental employment or brain work, or, as will be seen later, in mental impotence, by fear of impotency, by disgust or fright. The importance of the controlling fibres which run downwards from the brain is shown when these are interrupted by fracture-dislocation of the cervical cord. The early appearance of priapism, as soon as the effects of the concussion have passed away, its absence in fractures of the lumbar region where the reflex centre has been crushed, or in severe injuries of the cauda equina in which run the "nervi erigentes," are all explained by the above facts.* Again, as in executions by hanging, violent irritation of the upper cervical cord and its descending tracts frequently causes erection, while more chronic irritation of the tracts between the brain and the lumbar centre may account for the erections which may be so troublesome in early locomotor ataxy, general paralysis of the insane, and other spinal diseases. Finally, as illustrations of erections set up by peripheral irritation and travelling to the lumbar centre by the sacral nerves, thence to be transmitted along the "nervi erigentes," we have those set up by the fulness of the bladder in the early morning, inflammation of the prostate, and (especially in boys) the passage of a sound along the deeper urethra.

It remains to say a little about the **seminal fluid and its ejaculation**, and other important links in the complicated chain of actions on which fertile sexual intercourse depends.

While the most important part of the seminal fluid is formed by the testicle, this fluid gains from other glands—*e.g.*, the prostate, Cowper's glands and those of the urethra—other very essential properties—*e.g.*, its fluidity, and much of its bulk.

The addition of the prostatic fluid not only adds to the bulk of and dilutes the semen, thus aiding its expulsion by the muscular fibres which produce ejaculation, but, as shown by Krause (*Med. Times and Gaz.*, 1871, vol. i. p. 170), its presence is needed to keep alive the spermatozoa in the uterine mucus.† With its aid they often survive over thirty-six hours.

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* Why priapism is not met with in injuries of the lower dorsal cord is not so clear. Possibly in man the genital centre is elongated and is not confined to the lumbar cord. Again, after crushes of the lower dorsal cord the lumbar centre will be likely, from its contiguity, to be reached early by a descending traumatic myelitis.

† Dr. M. Wilson (*Lancet*, 1856, vol. ii. p. 483) had earlier attributed the same importance to the prostatic fluid, and considered the neutral phosphate of lime it contained as the element which protected the spermatozoa from too acid or too alkaline secretions in their long passage to the ovum, over many uneven surfaces.

The seminal fluid arrives by the vas deferens to be stored up in the vesiculæ seminales. It is prevented from passing into the urethra, under ordinary conditions, by the narrowing of the ejaculatory duct at its termination, and its closure by elastic cavernous tissue (Henle). At the moment of ejaculation, the ampullæ of the vesicles are emptied by the violent contraction of the smooth muscular fibres in which their walls abound, and also perhaps by the anterior fibres of the levator ani, which now also act upon the prostate and its secretion. Pumped violently into the urethra, the fluid has the secretion of the prostate, and that of Cowper's and the urethral glands added to it, the latter having already lubricated the passage. The ejaculatory action of the smooth muscular fibres of the vesiculæ seminales is thought to produce the final venereal orgasm; it is supplemented by the contraction of the accelerator urinæ, which probably sweeps the urethra clear. During ejaculation the swelling of the veru montanum prevents any semen passing back into the bladder. The compressor urethræ is also relaxed.

From the above it is plain that in cases of impotence and sterility not only the nerve centres, and certain nerve tracts, but also a series of acts extending over a considerable area and including many different structures, have to be considered.

Though all the above, normally, work harmoniously and, many of them, instantaneously as in ejaculation, it is clear that imperfect action or hesitation in any one of them may be sufficient to interfere with a fruitful coitus.

IMPOTENCE.

The **causes** of this, which are extremely numerous, are best divided into **two heads**—those which are (A) **physical** and often permanent, and those which are due to (B) **mental** or nervous disorder, these latter being often temporary, frequently exaggerated, and sometimes imaginary altogether.

A much more elaborate classification has been drawn up by the late Prof. S. W. Gross, who divided impotence into the following subdivisions: (i) **Atonic impotence.** This term is given to those cases where the reflex lumbar centre fails, wholly or partially, to respond to the ordinary stimuli; the centre is, in these cases, deficient in due activity, excitability, or tonicity, and the muscular walls of the arterioles and the muscular fibres of the erectile trabeculæ are prevented from relaxing and admitting the requisite flow of blood into the penis, while the contractility of the ischio-cavernosi and bulbo-cavernosus muscles is impaired. Prof. Gross considered that this abolished activity of the genital centre, and thus *atonic impotence*, are usually due to venereal excesses, especially masturbation; these caused hyperæsthesia, irritation, and inflammation of the prostatic urethra, and the constant irritation of the genital nerves thus produced brought about in this region an enfeebled and exhausted condition of the lumbar centre with which they are in communication. The above-mentioned writer further divided *atonic impotence* into the following classes: (1) The erection is imperfect and of short duration, and ejaculation is frequently too precipitate, but sexual desire remains, and intercourse is possible, although incomplete. (2) The erection is either so feeble that intromission is impossible, or it is entirely absent. As in the preceding variety desire is present. (3) Here there is not only loss of power of erection, but desire is completely abolished.

(ii) **Psychical Impotence.**—This is the same as mental or imaginary or false impotence. The impotence is due to the inhibitory control of the brain over the lumbar centre.

(iii) **Symptomatic Impotence.**—Here the impotence is due to the prolonged use of certain drugs, or exposure to certain chemicals; or it follows on various acute and chronic diseases.

(iv) **Organic Impotence.**—Here certain defects of the genital organs are the cause of the trouble.

(A) **Physical Causes of Impotence.**–(1) **Organic Variety of Gross.** (i) *Absence of Penis.*—An extremely rare condition, when congenital. A similar condition may result from phagedænic ulceration. Of this I have seen two instances, the penis having been destroyed as far as the symphysis pubis. I know of a third, brought about by a similar cause, in which the lady obtained a divorce. But even in cases where the penis has been removed close to the pubes, as the ejaculatory muscles retain their power and as penetration is not absolutely necessary for impregnation, it is never possible to be certain that this may not follow.[*] (ii) *Double Penis.*[†]—A still rarer condition. In the case of the Portuguese, aged nineteen, fully reported by Mr. Ernest Hart (*Lancet*, 1866, vol. i. p. 61) this abnormality did not render the patient impotent. (iii) *Large size of the penis* may be a cause, but it is usually only a relative one. It is generally temporary only, the vulvo-vaginal orifice yielding to repeated attempts at dilatation. It is noteworthy that this condition may be at the root of much local suffering and misery in newly married women. It is most likely to be met with in a wife married too early or too late. (iv) *Extreme degrees of hypospadias and epispadias*, the former including ectopia vesicæ. In these, the most frequent cases, where the opening of the urethra, still penile, is placed some way behind the glans, the question of impotence (and of sterility also) has not unfrequently arisen in affiliation and other cases (*Med. Times and Gaz.*, 1850, vol. ii. pp. 292, 321, 392). The questions here for the general practitioner to decide are the probable amount of power of erection, the site of the opening and whether the first is sufficient to bring the misplaced orifice within the vagina, or even in contact with the vulva. (v) *Curvatures of the Penis.*—These may be due to healing after injuries, or to the adhesion of the penis to the scrotum by a web-like band which is often present in perinæal hypospadias. In other cases the fault lies in a congenital shortness of the corpus spongiosum, or in scarring of this structure from the opening of an abscess. The curving is usually downwards. Lateral twists, also preventing intercourse, may result from previous injuries, as in coitus, which have caused inflammation, cicatricial contraction and atrophy of one of the corpora cavernosa, or from the chronic, circumscribed thickening in the same situation,* often met with in gouty patients. The last-mentioned condition may also produce upward curving of the penis. Gummata may, very rarely, bring about a similar condition. After wounds of one corpus cavernosum producing shrinking, the erection will be unilateral, one half only of the organ being distended. Where the corpora cavernosa have been divided as by a ligature tied tightly round, erection will only take place up to the scar which marks the site of ligature. (vi) *Varix of the dorsal vein* has been said to interfere materially with erection. In the one case that I have seen the disturbance was mental only. (vii) *A short frænum and tight prepuce, and calculi of the prepuce,* are other but temporary causes. Leaving the penis itself we come to the scrotum and testicles and find the following as causes of impotence. (viii) *A large hernia* or *hydrocele* (pp. 114, 133), or condition of *elephantiasis*, all these acting by dragging on the skin and burying the erectile structures of the penis, and the last sometimes affects the skin of the penis also. (ix) In *bilateral anorchism*, absolute impotence is present. In cryptorchids, where the testes are retained in the abdomen or the iliac fossa, the patients may be at first virile and fertile (p. 45), but as a rule, owing to the degeneration which these retained testicles gradually undergo, sterility, and later, perhaps, impotence, usually follow after awhile (p. 47). (x) *Bilateral Castration.*—Where this has been performed in the adult, erections and the ability to copulate may continue for a time with the emission of some fluid. In a varying interval, from one to four years, after the removal of the testes, attempts at coitus, which have been becoming rare and imperfect, generally cease altogether. (xi) Some forms of *atrophy* of the testicle, if bilateral, produce impotence—*e.g.*, occasionally, mumps—and the same may follow where one testis has been removed, and the other becomes the seat of atrophy following traumatic orchitis. Bilateral syphilitic orchitis and tubercular testis have been given as causes, but the accuracy of this latter is doubtful. Unless marked cachexia or phthisis coexist, impotence is not present, certainly in the earlier stages of tubercular testis, even if bilateral. In double syphilitic orchitis, owing to the wide diffusion of the disease, the virile power is greatly lessened or even abolished, but unless atrophy supervene, the impotence is only temporary.

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[*] See a case reported by Mr. Hind (*Lond. Med. and Surg. Journ.*, 1830), and one by Dr. Ryan (*Medical Jurisprudence*, p. 204).

[†] Nélaton, *Gaz. des Hôpitaux*, Jan. 1854; Goschler, *Vierteljahrschrift fur prakt. Heilk.*, Prague, 1857; Mende, *Ausführl. Handb. d. ger. Med.*, Bd. iv. S. 337.

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* Thickening amounting to ossification of the sheath and septum of the penis have been described by Velpeau and Malgaigne.

(2) **Symptomatic Impotence** (Gross).—(xii) Sexual power may be much diminished, or absolutely lost, after prolonged use of the following drugs: Bromide and iodide of potassium, and bromide of ammonium; these in scruple doses three times a day are efficient anaphrodisiacs; camphor and conium have also an influence, but one much more temporary and less marked. Prolonged use of other drugs, such as opium and morphia, may, by their effect on the nervous system, cause impotence; and the same may be said of tobacco-chewing, and alcoholism, though here the interference with the digestive organs and appetite have to be considered. Impotence in a temporary form has been known to appear in well-marked cases of lead-poisoning,* and the same has happened to workmen exposed to poisonous fumes—*e.g.*, those of antimony, and the vapour of sulphide of carbon. (xiii) Impotence is known to follow on certain diseases; some chronic, as established phthisis, advanced

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* Charcot (*Bull. de la Thér. Journ.*, 1864, p. 529), Rosenthal (*Wien. Klinik.*, S. 151) and others have observed that virility diminishes and may cease entirely with gradually increased doses of arsenic.

diabetes,* albuminuria, and affections of the nervous system;† and others acute—*e.g.*, the zymotic fever.‡ (xiv) Certain *injuries of the nervous system* may be followed by wasting of the genitals and impotence. During the chronic meningo-myelitis which follows on the severer forms of concussion of the spine, sexual power and desire are usually greatly impaired, and may be entirely and permanently lost. In cases of recovery after fracture of the lower dorsal or lumbar spine, the genital centre, situated in the lumbar enlargement, is usually disorganised. Where it has escaped, as in fracture higher up, erection and ejaculation may still take place by means of the reflex mechanism over which the above centre presides.§ As paralysis, however, is usually present, the patient is practically impotent.

(3) **Atonic Impotence** (Gross).—By this is meant a form of impotence due to a diminished activity of the genital centre, and thus an interference with the erection and ejaculation over which it presides. According to Prof. Gross this want of tone is usually due to hyperæsthesia and inflammation of the deeper urethra brought about by (xv) *masturbation and sexual excesses of different kinds.* In these patients the following local affections are not uncommon—nocturnal emissions, so-called spermatorrhœa, irritability of the neck of the bladder, relaxed condition of the prostate and "prostatorrhœa," small meatus, phimosis, stricture, granular patches in the urethra, gleety discharge. As any of these conditions are liable to bring about a constantly unhealthy condition of the urine, and thus a bad form of hypochondriasis, they may seriously influence the treatment, and Prof. Gross did valuable work when he drew attention to them. Of their frequency‖ there is no doubt whatever,

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* Dr. Willis (*Urinary Diseases and their Treatment*, 1839) alludes to the fact, well known at that time, that the sexual appetite generally disappears at a rather early stage of diabetes, and adds, that in one of the few cases of genuine recovery with which he is acquainted, the only function which remained in abeyance was the sexual. Dr. Pavy (*Diabetes*, p. 221) states that as the patient improves with treatment, virility will be found to return.

† These may be organic diseases of brain or cord, or functional affections—*e.g.*, "spinal irritation." In the latter the impotence may be only partial, false erections and hasty ejaculation being present.

‡ This may be due to the effect of the fever upon the system generally, or to that form of orchitis and atrophy which is occasionally present (pp. 283–288). During convalescence from acute diseases the sexual feelings may be often strongly marked.

§ A case of this kind is recorded by Dr. Brechet (*Recherch. Exper. sur le Syst. Nerv.*, p. 280).

‖ It is not sufficiently recognised that stricture, the most important of these local affections, often follows on masturbation only. Thus it is met with in though I think that their chief importance lies not in this, but in the above-mentioned effect they have on the minds of a certain class of patients (*vide supra*, p. 467). It will be seen that the atonic form of impotence of Prof. Gross is allied from its effect upon the nervous system to the following:

(B) **Imaginary. False Impotence. Psychical Impotence** (Gross).—Numerous as are the above given physical and material causes of impotence, the cases in which impotence is due to some mental influence are more commonly met with, or to speak more correctly, those cases most frequently come before us, in which the cause of the impotence is a combined one, due in part to some weakness or want of tone in the genital centre, dating usually to previous sexual excesses, and due in part also to the imagination of the patient. These cases are important not only on account of their frequency, but also because, like some of those already given, they are usually temporary, and admit of remedy, and finally because this mental or imaginary impotence is often a source of much misery and distress, fills the best years of a patient's life with fancied elements of bitterness, and renders him a nuisance to others as well as to himself.

Amongst the causes of imaginary impotence from the inhibiting control of the brain over the genito-spinal centre, are such mental conditions as excessive delight, fright, repugnance, suspicion of infidelity, exaggeration of the effect of past sexual sins, and the like. Numerous instances of these will be found recorded by writers on this subject—*e.g.*, Roubaud, Gross, and others.

Frequently when such cases of impotence come before the notice of the surgeon, they are seen to occur in patients of somewhat feeble and unmanly mind. Such are they who dwell much on past self-abuse, or failure to acquit themselves to their own satisfaction on some occasion of irregular intercourse, patients who make much of emissions, which may really not be unnaturally frequent, or who worry and torment the surgeon because they notice some urethral shreds or mucus, or who persistently exaggerate a slight varicocele

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young subjects who have never had gonorrhœa, and some of whom have never had sexual intercourse. It begins no doubt as a spasmodic and mildly inflammatory condition, kept up by frequent sexual excitement, but gradually passing into a real organic narrowing of the canal. It may be known by the twisted stream, the irritability of the bladder, the difficulty in manipulating a metallic catheter through the bulbo-membranous urethra, although a double silk web can usually be got through with a little trouble. This form of stricture was known to the older writers—*e.g.*, Sir E. Home, Lizars, and Wade. Its origin was well explained by Mr. Cooper Forster (*Guy's Hosp. Reps.*, 1876).

into a hopeless atrophy of the testicle (p. 525). No one can see these patients, often feeble and despondent, over-anxious and over-sensitive, very rarely manly in any sense of the word, and often the subjects of an atonic condition of their genital centre (and in fact of the whole spinal cord) from past sexual excesses, without at once understanding how in such cases the capability of sexual intercourse, which requires for its satisfactory performance the co-ordinated and harmonious action of mind and body, would very likely be deficient.

Treatment.—While, as seen from the above list, some of the causes of impotence are beyond remedy, others obviously admit of treatment, or are of themselves naturally of a temporary nature. In those forms of impotence which exist largely or entirely in the patient's imagination, success is assured if the surgeon, acting also as a friend, can improve his patient's mind. On the other hand, many of the subjects of those physical forms of impotence which do not admit of remedy are often mercifully wanting, not only in sexual power, but also in sexual desire.

I will speak first of those local points which require attention. Instances of an obvious group requiring no more than a passing allusion are a tight prepuce, or a short and easily lacerated frænum. Where the surgeon satisfies himself that the deeper urethra is over-sensitive and in a state of irritability, a well-plated steel sound should be passed at intervals of two or three days and left in for an increasing interval. Where frequent micturition, a twisted stream, and the impossibility of passing the above instrument point to the existence of further mischief, the stricture must be dilated or, if needful, submitted to internal urethrotomy. Where over-frequent emissions, discharge of prostatic mucus, feeling of dull weight in the perinæum, tenderness of the prostate on pressure with the finger on the rectum, point to morbid sensibility of the prostatic urethra, an astringent may be applied, usually silver nitrate x or xx gr.-℥j, this being done by one of the different catheter-syringes, or, if the solid salt be used, by a cupped sound or porte-caustique, or Harrison's urethral suppository * introducer. Sometimes flying blisters made by pencilling the acetum cantharidis on one side of the perinæal raphè, and then, when this has healed, on the other, are of the utmost benefit (Gross). This remedy should be applied in the morning, as it is liable to prevent sleep, and every care should be taken to present blistering of the adjacent parts.

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* These suppositories contain a quarter of a grain of silver nitrate, two grains of tannin, or half a grain of lead acetate.

In other cases the use of cold to the deeper urethra, water cooled down to 52° F. being run in, for five or ten minutes, by means of a double-current, eyeless catheter closed at its beak, to the other end of which two drainage tubes are attached, one being connected with the reservoir placed a few feet above the patient, and the other discharging into an empty vessel.

Two other local remedies perhaps merit attention—one is that of mild counter-irritation to the glans penis, or the use of the electrical brush, when natural sensibility is wanting; the other is the electric current. A current, generated by about twenty cells, may be passed in the following manner (Gross), at first for two or three minutes, then for five minutes, every forty-eight hours. The positive electrode, which should be of large size, is placed over the lumbar spine, and the cathode carried over the glans penis, testis, and perinæum. If this fail, faradisation of the bulbo- and ischio-cavernosus may be tried. Galvanisation and faradisation may also be useful when the symptoms are more general—*e.g.*, those of neürasthenia or spinal exhaustion.

The use of drugs must next be alluded to. Sedatives and anaphrodisiacs—*e.g.*, potassium bromide—are useful from their power of diminishing the reflex irritability of the cord and sexual centre, and thus of quieting sexual desire. Thirty grains may be given every eight hours, or, if this makes the patient drowsy in the day-time, a drachm may be taken at bedtime. Where there is any evidence of bromism, where the drug causes much bodily or mental depression, Dr. Gowers advises a combination with Fowler's solution, Rosenthal one with a diuretic—*e.g.*, 10 gr. of potassium nitrate or bitartrate. Turning to another group, aphrodisiacs, all those of ordinary repute are most uncertain save cantharides, but as this acts by its irritating effect upon the genito-urinary mucous membranes, its use in doses at all likely to be serviceable is certainly attended with danger. Tonics, which act indirectly, are the most reliable aphrodisiacs. There is no better combination than one of twenty drops of tr. ferr. perch., ten of tinct. nuc. vom., and one or two grains of quinine. Fellows' syrup of the hypophosphites is another reliable form.* The above should be aided by a liberal diet, as much meat as can be assimilated, and a regular allowance of alcohol.

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* The fluid extract of damiana in doses of from 2–4 drachms every eight hours, has been much extolled by American writers of recent years.

With regard to testing the value of patients' statements on the subject of their impotence, the following words of Sir J. Paget (*loc. supra cit.*, p. 283) will be found useful: "If a man has sexual organs, including the prostate, not manifestly diseased or wasted, and has erections and occasional nocturnal emissions and any sexual desire, you may be sure that he is not impotent, unless he has very clear facts to prove that he is. The statements that hypochondriacs make to show that they are, or are becoming, impotent, are usually evidence that they are not."

The question of the advisability of marriage is often raised in cases of impotence. In most of the organic cases and in many of the symptomatic the answer will, usually, be in the negative. But the decision is less clear and easy in those cases where it is more common for this question to be raised—viz., by patients where the impotence is atonic or psychical. Of the latter, some will be anxious on account of long-continued continence and the quiescent condition of the sexual organs which has followed on severe control. Of others, recently married, some will come, strange though it seem, sufferers from mere ignorance, or from a manly dread of inflicting pain on a tenderly loved wife. But the majority of these imaginary impotents are often either oppressed by a knowledge of past excesses, or weighed down by an animal dread of "not being able to play their part," or of "disgracing themselves," &c. &c. It is difficult to impress on such minds as these with such a standard of marriage and "its duties," that their wives are not as educated as themselves in these matters, that they will be glad enough to be spared from excesses, and that to look upon them as being as expectant as themselves is to place them on a level but little higher than that of a harlot. A judicious and high-minded medical man will have little difficulty in gaining the confidence of these patients and in assuring them that their fears and ill-omens are extremely common, that they are as groundless as they are common, and that it is very usual for the "consummation" of marriage to be somewhat delayed.

STERILITY.

This condition, or the inability to beget children, has been confounded with impotence, or the incapacity for sexual intercourse. The two conditions are distinct, though they may co-exist (p. 478). Sterility, though its causes and treatment, as they arise in the female, have been much discussed, has received much less attention in the male. The important effect of sterility in the husband upon the health of the wife has already been alluded to (p. 478), and the possibility of the former being at fault, though owing to the presence of emissions the husband may scout the idea, is always to be remembered, when the wife is going to be submitted to investigations which may be as uncalled for as they are likely to be unwelcome.

Sterility includes the following distinct varieties:—I. **Azoospermia.**—Here the power of copulation and emissions may exist but no spermatozoa are present in the ejaculated fluid. II. **Aspermia.**—Here, while the power of copulation is present, no emission takes place. III. **Mal-emission.**—Here the power of copulation may or may not be present, fluid containing spermatozoa is ejaculated, but is not lodged within the vagina.

I. **Azoospermia.**—Here no spermatozoa are found in the ejaculated fluid, this being due either to none being formed in the testicle, or if fertile fluid is formed there, to some hindrance to its expulsion being present. This variety is placed first, because existing, as it does, with power of copulation and of emission, its presence is overlooked, and also on account of its effect upon the wife's health already alluded to (p. 478). As Dr. Fürbringer (*Deutsch. Med. Woch.*, 1888) remarks, it is this condition which sends the unfortunate wife from physician to physician to have her cervix divided, or her uterus curetted, until a glance at the microscope proves that want of spermatozoa is really at the root of the sterility.

The following are the chief **causes** of this form of sterility:

(1) *Congenital bilateral anorchism* (pp. 23, 27), or *monorchism*, with extensive disease or injury of the opposite testicle. (2) A somewhat similar condition of things, but the congenital deficiency is here a bilateral or unilateral absence of the *excretory apparatus* (p. 24 *et seq.*). (3) *Bilateral retention or ectopia of the testis*, or a unilateral condition of this kind, in which the other testicle has been rendered inefficient by injury or disease. This question has been fully considered in chapter ii., especially at p. 45. (4) *Certain affections of the testicles.* These may be temporary or permanent. Instances of the former may be present from the presence of a large double hydrocele as in M. Roubaud's case, related at p. 134; syphilitic orchitis is another, though here, if the treatment is not sufficiently timely or efficient, the sterility may be permanent. Tubercular disease may, if advanced and bilateral, be a cause of sterility usually permanent. But in this disease localised foci of gland tissue remaining unattacked may suffice

for the production of semen, although the escape of this may be prevented by more advanced disease in some part of the excretory passage. Atrophy, when advanced, from whatever reason (chap. x.), and new growths are other causes of this variety of sterility. It has been already stated (p. 484) that while loss of the testes, as from castration, is of course a cause of azoospermia, ejaculation of the fluid of the accessory glands may follow on venereal excitement at repeated intervals for months or years. (5) *Obstructions in the epididymis or vas deferens.* This is a very important cause of azoospermia (p. 267). M. Gosselin (*Arch. Gén. de Méd.*, t. xiv. p. 405, and t. xv. p. 40) has published several cases in which after inflammation, usually due to gonorrhœa, the lower end of the epididymis was found by dissection to be obliterated in a mass of fibro-cellular tissue, clearly cicatricial, and due to the inflammation lingering longest at this spot. No fluid could be injected through the obstruction, and the corresponding vesicula seminalis, though of normal size, was devoid of spermatozoa. While obliteration was most frequently met with in the globus minor, M. Gosselin also described obliterations occurring in the head of the epididymis, but as, here, instead of a single canal, the seminal ducts are multiple, the obstruction is not so important. One very interesting case of obliteration of the vas deferens throughout the greater part of its course was also mentioned. In another case the vas deferens was found thinned suddenly, and converted for a length of 1 centimetre into a cellular filament. The excretory duct of the vesicula seminalis on the same side was obliterated. The epididymis, enlarged to six times its natural size, contained a thick yellow fluid showing a multitude of dead spermatozoa. The seminal vesicle contained abundant thin fluid, devoid of spermatozoa. The testicle was normal. The noteworthy absence of atrophy of the testis in these cases of obliteration is to be explained by the abundant facilities for absorption which are here provided. And that absorption is impeded in these cases is shown by the fact that patients who are the subjects of induration in the tail of the epididymis (the most frequent site of the obliteration) are liable to uneasy feelings or pain in the testicle, or along the cord, after sexual excitement. Liégeois (*Med. Times and Gaz.*, Oct. and Nov. 1869) and Ultzmann (*Wien. Klin.* 1879, S. 156), who have adduced proofs of the frequency of the above condition, go so far as to believe that the two testes are so closely united, reflexly, that unilateral epididymitis may bring about sterility by abolishing the functions of the opposite gland. This is supported by five cases, recorded by Kehrer, of unilateral epididymitis in which spermatozoa were entirely absent, but it is quite contrary to what we know of other and symmetrical glands. While old gonorrhœal inflammation is the most common cause of obliterations in the epididymis and vas deferens, the same result may, occasionally, be brought about by tubercular lesions, or by syphilitic epididymitis. (6) Lastly there are certain conditions of the semen, which, though rare, require mention, as they probably interfere with the activity and vitality of the spermatozoa. Such are the addition of pus, met with in inflammation of the prostate, seminal vesicles, epididymis, and vasa deferentia. A case of this kind is given in Part IV., DISEASES OF THE VESICULÆ SEMINALES. It will be seen that in this purulent semen the spermatozoa were few and dead. Terrillon (*Ann. de Dermatol. et de Syphil.*, sér. 2, t. i. p. 439) has shown that the fluid ejaculated in acute bilateral gonorrhœal epididymitis contains abundant pus corpuscles (its colour being yellowish, almost green), but that spermatozoa are nearly always absent. He records one important case which shows that as long as six years after the cessation of the inflammation, the semen, though containing but little pus, was still devoid of spermatozoa.* Other causes of absence of spermatozoa in the semen are venereal excesses, with or without neurasthenia, and exhausting disease—*e.g.*, phthisis, or chronic disorders of the kidney, brain, &c.

The **treatment** of azoospermia must vary with the cause. It will be seen from the permanent nature of many of these that it must often be most unsatisfactory.

II. **Aspermia.**—Here the sterility is due to the fact that during coitus no ejaculation of semen takes place, either because none enters the urethra, or because its further expulsion is hindered by some obstacle between the prostatic urethra and the meatus. Kocher divides the disease into the two following groups: (1) **Permanent** and (2) **Temporary aspermia.** Prof. Gross divides it into the four following groups according to its cause: (1) **Organic aspermatism**, due to obstruction of the ejaculatory ducts or the urethra. (2) **Atonic aspermatism**, the excitability of the ejaculatory centre being deficient. (3) **Anæsthetic aspermatism**, the sensibility of the nerves of the penis being abolished. (4) **Psychical aspermatism**, due to inhibition by the brain of the centre for ejaculation.

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* While on this matter of coloured semen, I may briefly allude to bloody semen. This has been noticed in various diseases (Demarquay, *Gaz. des Hôp.*, 1865)—*e.g.*, along with hæmaturia of the tropics, but more often in the course of inflammatory disorders, inflammation of the seminal vesicles, urethritis, epididymitis, acute and chronic, excesses in coitus, and masturbation.

(1) **Organic Aspermia.**—Here the lesions may be remediable or permanent. The following are known. (*a*) *Congenital abnormalities—e.g.*, absence or occlusion of the ejaculatory ducts. It will be seen from chapter ii. SECT. 1. that the excretory passages of the semen may be wanting totally or in part. But I am not aware that any case is recorded where not only was such a result found at the necropsy, but the clinical history of the case was at hand also. The following cases are possibly instances of this form of organic aspermia, but they were not verified. Schmitt (*Wurzburg Med. Zeitsch.*, 1862, Bd. iii. S. 361) and Ultzmann (*Wien. Med. Presse*, 1878, S. 6) relate cases of men of thirty-five and twenty-four who had never had emissions, either asleep or awake, though their power to cohabit was unimpaired. (*b*) *Stricture of the ejaculatory ducts or misplacement of their orifices.* After extension of gonorrhœal or other inflammations to the prostate, or by cicatrices due to injury, or to the long retention of a catheter, the ducts may be rendered impermeable, or their orifices occluded. Tubercular deposits, when they soften, may actually destroy them. La Peyronie (*Mém. de l'Acad. Roy. de Chir.*, t. i. p. 316) gives the case of a man, father of three children, who, in consequence of a neglected gonorrhœa, lost the power to ejaculate, although semen oozed away shortly after coitus. At the necropsy, a cicatrix was found on the veru montanum, which had so changed the direction of the ejaculatory ducts that they looked backwards towards the bladder. Demeaux (*Gaz. des Hôp.*, No. 21, 1860) found in a man, aged twenty-three, that after an abscess in the perinæum from a fall, no seminal fluid was ejaculated, but the urine passed after coitus contained abundant spermatozoa. As no stricture was present, he inferred that the ejaculatory ducts had been displaced. Occasionally the obstruction may give way. Thus, there is a case recorded by Hirtz (Schmidt's *Jahrb.*, 1862) of a man who after a severe attack of gonorrhœa had no discharge of semen though he was well able to copulate, the urine passed immediately after the act containing numerous spermatozoa. On one occasion, during connection, the patient felt a sudden pain, followed by ejaculation and hæmorrhage. This connection proved to be fruitful. Injury to the ejaculatory ducts during lateral lithotomy is another cause of sterility. Thus, Mr. Teevan (*Clin. Soc. Trans.*, vol. vii. p. 179) related four such cases. Gross (*loc. supra cit.*) states very briefly that he has noticed sterility from this cause in two cases. The explanation of these cases is not very clear. In Mr. Teevan's cases it does not appear that the

calculi were large ones, but it is clear that much tearing of the floor of the urethra, or inflammation of the prostate after such laceration, might cause occlusion of the ducts, situated as these are, towards their openings, so close to each other. Having seen many years ago two cases in which permanent incontinence has followed the operation of lateral lithotomy in boyhood (one in a patient of Mr. Hilton's), I am inclined to look on the above cause of sterility as a real one. It is obvious that an injury which may, very occasionally, so damage the neck of the bladder as to cause permanent incontinence of urine, may also cause permanent injury to the ejaculatory ducts. (*c*) Another condition of the *ejaculatory ducts* giving rise to aspermia is *their obstruction by concretions*, composed of spermatozoa, concrete mucus and epithelial cells. One of the best recorded instances of this kind is a case of De Blégny's (Civiale, *Traité Prat. sur les Malad. des Organ. Gén.-Urin.*, t. ii. p. 234) in which the ducts were occluded with small, hard, spherical concretions as large as peas. The patient, a widower, aged sixty, and the father of several children, married a second time, but was unable to ejaculate. Beckmann (Virchow, *Arch.*, Bd. xv. S. 540) found a concretion as large as a cherry in the ejaculatory duct of an old man, the organic portion of which was composed of spermatozoa, and the inorganic principally of phosphate and carbonate of lime. Reliquet believes (*Gaz. des Hôp.*, 1860, No. 21) that though only one duct is thus obstructed, it will, in its distended state, press upon the other and pervious one, and so close it, and thus lead to loss of power to ejaculate. He thinks, also, that this obstruction may give rise to a condition he calls "spermatic colic," viz., reflex contraction of the neck of the bladder and adjacent parts, tenesmus and pain in the perinæum and penis, and pain in attempted intercourse much increased during ejaculation. Examination per rectum reveals a small swelling in the region of the prostate. If this be compressed between the fingers and a sound in the urethra, either the swelling at once disappears, and the sound is found to be covered with little soft masses like bits of vermicelli, or there will be an abundant discharge of spermatozoa together with concretions at the next act of micturition. (*d*) *Stricture of the urethra.* Here the seminal fluid, unable to escape at the right moment, regurgitates into the bladder, and is discharged subsequently with the urine. Sometimes the stricture is organic and of long standing. Kocher relates the case of a man, aged forty-eight, brought to him on account of urinary troubles.

A blow on the perinæum twenty years before had been followed by abscess, double epididymitis and hardening in each globus minor. For the preceding eight years urinary troubles had been developing and the patient had observed that emissions no longer followed coitus, though that act was performed with the same feelings as before. In other cases the obstruction to the escape of seminal fluids is to be found rather in muscular spasm, than in a definite organic stricture (Gross). Probably some slight degree of stricture is present in these cases, keeping up the spasm on which the obstruction depends. It is easy to understand how a narrowed lumen, which in the flaccid condition of the penis admits the passage of urine, may, during erection, when the lumen of the urethra is naturally diminished, become so narrowed through spasm that the semen confined between the stricture in front and the turgid caput gallinaginis behind, is unable to escape in either direction until the penis again becomes flaccid.

(2) **Atonic Aspermia.**—Professor Gross gave the above name to those cases of sterility where the absence of the ejaculation of seminal fluid is due to loss of contractility of the muscles of the seminal vesicles, ejaculatory ducts, prostate, or urethra, and not to any organic obstacle. The sexual act is never completed, the patient abandoning his efforts merely from exhaustion. Nocturnal emissions, however, take place with the usual feelings. In organic aspermia, on the other hand, coitus is finished with a discharge which escapes later, or when the ejaculatory ducts are obstructed, with the ordinary convulsive movements and sensations. Schulz, Ultzmann, Rosenthal and Kocher hold the same view. This form of aspermia is usually met with in those who have been addicted to venereal excesses, and in the subjects of neurasthenia. It is closely allied to the atonic form of impotence (p. 485), and the same condition of the urethra are often present here.

(3) **Anæsthetic Aspermia.**—Professor Gross gave this name to those cases in which the failure to ejaculate appears to be due to insensibility of the glans or skin of the prepuce. An instance given by Lallemand in the case of a soldier who, after a spinal injury, was affected with insensibility of the skin of the genitals. Abundant nocturnal emissions occurred at long intervals, but no ejaculation followed on coitus or masturbation, to the latter of which the patient resorted with the view of relieving the priapism which interfered with micturition. Somewhat analogous cases are given by Curling. In one of these, the patient, aged forty-four,

was unable to ejaculate on account of insensibility of the glans and skin of the penis. The prepuce had been destroyed by syphilis, and the entire dorsum of the penis covered by a large indurated scar. In other cases it has been suggested that non-emission is due to some deficient sensibility of the prostatic sinus and prostatic urethra by writers (Van Buren and Keyes, *Surg. Dis. of the Gen.-Urin. Organs*, p. 466) who look upon this region as the site of the pleasurable orgasmic coitus.

(4) **Psychical Aspermia.** — Professor Gross gave the above name to the form of aspermia in which the centre for ejaculation is temporarily inhibited by the brain, on the following grounds—viz., many men, in order to avoid impregnation, are able to retard an emission until the penis is withdrawn from the vagina, and two cases are recorded by Roubaud (*loc. supra cit.*, p. 24[illegible]) and Hicquet (*Bull. de l'Acad. de Roy. de Méd. de Belgique*, sér. [illegible], t. iv. p. 482) in which the ejaculation instantly ceased if the patient awoke during a nocturnal emission.

Finally, cases occur in which the **cause** of the failure to ejaculate and the sterility remains **unexplained.** Such an instance is given by Sir G. Humphry (*System of Surgery*, vol. v. p. 160). A gentleman enjoying good health and strength had never been able to effect complete intercourse with his wife. Erections occurred, but however long the attempt was continued emission did not take place. This, however, often occurred afterwards during sleep, and at other times, but was not excitable by the proper stimulus. Before marriage the patient was liable to rather frequent emissions. There was no other symptom. A variety of treatment had been tried by Sir G. Humphry and others, without avail, including tonics, belladonna, blisters to the perinæum, passage of a steel sound, cauterisation of the urethra, galvanism, and, with a view of increasing the irritability of the adjacent parts, stimulating applications to the glans and perinæum.

Treatment.—In many of the varieties—viz., those due to organic lesions—little can be done, save in such cases as stricture, or phimosis. The treatment of the atonic forms has been already given.

III. **Mal-emission.** — Cases occasionally occur in which sterility is due to the ejaculation taking place in a faulty direction, so as not to be lodged in the vagina. The most frequent causes of this are hypospadias and epispadias, especially the first. As already stated (p. 483), the slighter degrees of hypospadias will not interfere with penetration and normal ejaculation. But in the penio-scrotal variety sterility is usually present, though in exceptional cases (Casper, p. 251) the posterior wall of the organ may so far replace the deficient floor of the urethra as to permit the semen to reach its destination. This matter has been already alluded to (p. 483). Professor Gross gives another occasional variety of mal-emission due to misplacement of the meatus, dating to shortening of the frænum, congenital or acquired.

PART II.

DISEASES OF THE CORD.

CHAPTER I.

INFLAMMATORY AFFECTIONS OF THE CORD.

THESE are rare but important owing to the proneness of inflammation to spread along the numerous planes of connective tissue in this neighbourhood, and to the possibility of the processus funicularis remaining open.

Inflammation of the cord may be acute or chronic, of the varieties known as plastic, suppurating, or sloughing. An instance of the danger of **acute inflammation** here is seen in erysipelas in children started by an intertrigo, or some such trivial cause, and causing fatal peritonitis by travelling along an open peritonæal process (p. 162). Another instance of inflammation which may be met with in the cord has also been alluded to in the Chapter on Epididymo-orchitis (p. 253), where mention was made of the fact noticed by French writers that gonorrhœal mischief, starting in the deep urethra and travelling along the vas deferens, may occasionally attack this tube and the cellular tissue around it without reaching the epididymis (Gosselin, *Clin. Chir. de la Charité*, t. ii. p. 369). The following case, which came under my notice at Guy's Hospital in November 1892, shows that the inflammation descending from the urethra may spend most of its force upon the vas, the epididymis being affected to a much less degree. J. C., aged thirty-one, came with a swelling of the right groin which he attributed to his heavy work in coke shovelling at a gasworks. The right epididymis and testis presented, in a mild degree, the flattened oval outline, with reddened scrotal skin, of an epididymo-orchitis; the vas deferens as it ran up from the globus minor was of the size of the barrel of a stylograph pen, while the cord from the external to the internal ring was of the size of two adult fingers, standing out in distinct outline beneath the skin of the groin. A purulent urethral discharge was present, and a distinct stricture four inches from the meatus. The terrible risk of peritonitis from propagation has been described by Godard (*Gaz. Méd.*, 1856) and Peters (*Un. Méd.*, 1856); see also Part IV., "Dis. of Vesiculæ Seminales," and p. 266. MM. Monod and Terrillon quote an interesting case in which the cause of the peritonitis remained obscure until epididymitis made its appearance. Inflammation of the vas deferens occasionally terminates in abscess.* This may be true of the gonorrhœal variety, of which Verneuil gives two instances (*Dict. Encycl. des Scien. Méd.*, p. 325). Mr. Hutchinson has recorded (*Med. Times and Gaz.*, 1871, vol. i. pp. 419, 471) a most interesting case in which, after the operation of lithotrity, much vesical and prostatic irritation ensued, followed, later, by a succession of abscesses in the abdominal wall in each iliac region. "These began in each instance by deep-seated pain, great swelling and induration, and in each instance we had to cut through great thickness of tissue to evacuate the matter. I have no doubt that these abscesses had their starting-point in the inflamed vas deferens." Mr. Hutchinson takes care to point out that there was no evidence whatever that these abscesses were pyæmic. They formed solely in connection with the genito-urinary apparatus, and none ever threatened in the joints or other distant parts. The patient ultimately made a good recovery.

Turning to more **chronic inflammations** we find the vas deferens very rarely attacked at any stage of syphilis. In syphilitic orchitis it is well known that the cord generally remains intact, and this integrity of the vas deferens is accepted as a diagnostic sign. Some exceptional cases have, however, been recorded. Verneuil (*Bull. de la Soc. Anat.*, 2^{e} sér. t. i. p. 12, 1856) related a case in which a gummatous swelling of the cord formed a mass twice the size of a fist. Hard, and the seat of dull pains with exacerbations, it had been taken at first for a cancer. A similar product was met with in the right auricle of the heart. Lancereaux gives details of a case of syphilitic disease of the testicle in which the cord was enlarged and swollen in several places, one of the swellings being as large as a chestnut. In **congenital**

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* An instance of abscess in the course of the spermatic cord simulating hernia is given by Mr. Turner (*Lancet*, 1886, vol. i. p. 443). The history here was very incomplete, and the exact site and causation of the abscess are not given. The patient was a child of three.

syphilis the cord has, very rarely, been found affected, as in the case given at p. 312. Other very rare cases of inflammatory swellings of the cord, especially in its lower part, may be occasioned by the inflammation of a varicocele, or of the vas aberrans of Haller. Gosselin (*loc. supra cit.*, p. 379) seems to have met with two cases of this kind, in which, after gonorrhœa, a small very painful swelling, having the shape of a hard cord, ending in an enlargement, appeared on the outer side of the epididymis. The testicle and epididymis were intact.

HYDROCELE.

Under this heading the following varieties will be described: (i) **Acute hydrocele of the cord.** (ii) **Diffuse or infiltrated hydrocele of the cord**, an œdema-like affection implicating the areolar tissue which unites the different constituents of the cord. (iii) **Encysted hydrocele of the cord**, in which the collection of fluid is contained in a definite cyst or cavity.

(i) **Acute Hydrocele of the Cord.**—Of this affection we know very little. It is even doubtful whether its pathology is sufficiently established to entitle it to the above title. It must suffice to say that in a few cases a swelling has quickly appeared after a strain, especially in young subjects, with evidence of some inflammation and pain, and of tenderness and tension in the region of the cord. The swelling is translucent and contains fluid resembling that of ordinary hydroceles. With regard to the exact position and origin of this fluid, different opinions have been held. Most probably we have to do with an acute inflammation of the remains of the processus funiculo-vaginalis, a theory rendered the more probable by most of the cases having been met with in young subjects. M. Mollière (*Dict. Encycl. des Scien. Méd.*, xxi. p. 85), who has met with several cases of acute hydrocele in adults in whom the parts were previously quite normal, looks upon them as 'une funiculite rheumatismale.' The chief point about these cases, whatever be their nature, is to remember the possibility of their existence, and the fact that, occasionally, especially if inflamed, they resemble a bubonocele. The **symptoms** will be those of an incarcerated rather than of a strangulated hernia, and will almost certainly yield to local treatment such as iced lead lotion, or hot lead and opium lotion, with absolute rest, and restricted diet. These failing, an antiseptic incision will clear up the case.

(ii) **Diffuse or Infiltrated Hydrocele of the Cord.**—The different components of the spermatic cord are held together by loose connective tissue and enveloped by a layer of this which is continuous above with the sheaths of the abdominal muscles, while, below, it may be traced over the epididymis and testis to become continuous with the sub-serous connective tissue beneath the tunica vaginalis. The cremaster is spread out upon its outer surface. Within this sheath of connective tissue, described by some as a special fascia, the tunica vaginalis communis, the meshes which unite the constituents of the cord become, occasionally, the seat of a diffuse serous infiltration. This is probably of the nature of an œdema, but its causes are very obscure. The above connective tissue is very rich in lymphatics and small veins, and it is, perhaps, some pressure on these which gives rise to the hydrocele. Mr. Curling suggests that enlargement of the lymphatic glands which lie in the course of the cord would produce such a result. The affection is a very rare one.*

Symptoms.—The swelling is uniform, cylindrical or somewhat pyriform, with the large end downwards, from the fluid gravitating down into the lowest cellular tissue, the meshes of which tend, from the pressure, to run into each other. The smoothness and uniformity of outline are due to the fluid being bound down by the above tunica vaginalis communis. The whole cord is distinctly larger than usual, and gives the feel of an omental hernia. The testis and epididymis are normal, but may be a little encroached upon by the swelling. There is no pain, but discomfort is present from the dragging weight. By gentle and continued pressure the swelling can be made to recede, but it returns immediately when the pressure is removed, and that as readily when the patient is lying down as when he is erect.

Diagnosis.—An omental hernia is the condition which is most likely to be mistaken for diffuse hydrocele of the cord. Both extend upwards along the cord into the canal, both feel somewhat dense, and yield but slightly to pressure, and neither is sensitive to handling. The points of distinction are chiefly these—the hernia gives a better impulse when the patient coughs; it can usually be more completely and easily returned; and it feels granular or lobulated on careful examination, instead of being uniform. After its return the cord and external abdominal ring can be more completely made out than is possible in the case of the hydrocele. Where, however, the omental hernia is irreducible, or where the subject of the hydrocele is stout, the diagnosis will be very difficult and can only be cleared up, when necessary, by careful antiseptic exploration.

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* Pott (*Practical Remarks on the Hydrocele*) has given three cases, and a masterly account of the disease. See also Scarpa's "Memoria sull' Idrocele del Cordone Spermatico."

From among the hydroceles the diffused form may be known by its less clearly marked and less rounded outline, its extension upwards, and the alteration produced by careful, kneading pressure.

Treatment.—Owing to the large size to which this form of hydrocele may attain, and its tendency to re-collect after tapping or acupuncture, radical treatment will usually be called for. In such cases, the situation of the fluid—in connective tissue very rich in lymphatics and continuous with numerous planes of the same tissue—must be remembered, on account of the risk that operative interference may set up diffuse inflammation and septicæmia. Mr. Pott (*loc. supr. cit.* p. 46) in a case where, after tapping and withdrawing of eleven Winchester pints, the fluid had re-collected, opened the hydrocele very freely. "The discharge of water continued large, the wound neither inflamed nor digested, nor, on the other hand, did it wear any face of gangrene or mortification; but his languor and anxiety increasing hourly, this wound remaining in the same unaltered state, on the fourteenth day he died." Mr. Pott attributed the fatal result here to the large discharge of serum rather than to the free division of "membranous parts." Thus, he adds that the patient's "manner of dying was very much like tha of those who are destroyed by large hæmorrhages."

Where radical treatment is early called for, acupuncture ar tapping, followed by well applied pressure, having failed, and possible causes of this condition having been removed, antisep incision and drainage of the swelling, followed by carefully appl pressure to the inguinal canal and support to the scrotum, will the wisest treatment.

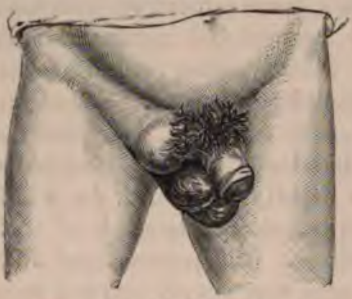
(iii) **Encysted Hydrocele of the Cord.**—The here, instead of being infiltrated or diffused through the nective tissue of the cord, is contained in a distinct cavi cyst.

Pathology.—These cysts may originate in different (*a*) Most frequently, and corresponding with the fact th hydrocele is most often met with before adolescence, i unobliterated portion of the processus funiculo-vaginalis frequency with which this deficiency persists has alrea alluded to (p. 162) under the head of congenital hydrocele. According to Prof. Engel (*Wien. Woch.*, 1858, S. 490) obliteration takes place earlier on the left side than on the right; this more frequent persistence of patency on the right side thus accounting for the greater frequency of right-sided congenital hernia, congenital hydrocele, and also encysted hydrocele of the cord. From this imperfect obliteration of a process of serous membrane result one or more persistent cysts, which may easily become distended with fluid. While operating for a right-sided strangulated inguinal hernia, I have met with five cysts arranged linearly, lying behind the sac of the hernia, and in intimate relation with the cord. Placed just within the external abdominal ring, they varied in size, from the head of a shawl-pin to that of a hazel-nut. They all contained clear watery fluid, but were not tightly distended, in which fact and their deep position perhaps lies the explanation of their not having given rise to any symptoms. The patient, aged fifty-three, made a good recovery. The sacs were simply snipped away with scissors.

The other causes of origin are independent of any abnormal persistence of the peritonæal process, and are still less frequently met with. Such are (β), extravasation of blood into the cellular tissue of the cord after a strain, the fluid part becoming encysted and its colouring matter absorbed. (γ) Mr. Curling points out that possibly the organ of Giraldès, which usually remains so minute as to be rarely perceptible, may occasionally form an encysted hydrocele low down in the cord. The relation of this body to encysted hydroceles has, owing to its constant position just above the epididymis, been already discussed at p. 197. (δ) Cystic swellings have been described as arising in the sac of a hernia, the sac being empty of bowel or omentum, and usually shut off from the peritonæal cavity (Duplay, *Des collections séreuses et hydatiques de l'aine*, Thèse, Paris, 1865; Gosselin, *Leçons sur les hernies abdominales*, p. 324; Debrade, *Étude sur l'hydrocele des sacs herniaires anciens*, Thèse, 1878). (ε) I suppose, as a case of hydatid has been recorded in the scrotum (*vide infra*), it is possible for one of these to give rise to a cyst-like swelling in the cord.

Symptoms.—The following refer to the commonest variety of encysted hydrocele that originates in the remains of the peritonæal process. The swelling is usually a defined one, single, oval in shape, translucent, with uniformly smooth surface, indolent and painless, and freely movable. The defined, tense outline usually present is due to the cyst being beneath the investing cellular sheath of the cord, the so-called tunica communis, of which mention has been already made; this position also explaining the indistinctness of the fluctuation usually met with. When more than one cyst is present, their origin in a persistent process is almost certain. The cyst may be met with at any part within the vaginal canal, immediately above the testis (fig. 68), or between the two. The last-mentioned site is most frequent—*i.e.*, just below the external abdominal ring. While, as above stated, the age at which the swelling is brought for treatment is usually early in childhood or boyhood, many cases have been recorded in which it has not been noticed till much later. I have given one above at p. 503. Langenbeck and Socin give cases in which the patients were thirty-eight and forty-seven. Mollière (*loc. supra cit.*) states that he has twice met with the affection in old men over sixty. Mr. J. Hutchinson, junior, has recorded (*Path. Soc. Trans.*, vol. xxxvi. p. 296) a case which is interesting, not only on account of the age, but also because of the possible origin of the swelling. In a patient, aged fifty, who died of ascites, a hydrocele in two compartments was present, reaching from the inguinal canal to the tunica vaginalis; its contents could not be reduced within the peritonæal cavity. The cyst was perfectly circumscribed, and perhaps originated in the ascitic fluid working down into the remains of a peritonæal process, and then becoming shut off. It was on the right side, there being nothing of the kind on the left.

FIG. 68.



Encysted hydrocele of the cord. (Bryant.)

Diagnosis.—Encysted hydrocele of the cord is liable to be taken for hernia, especially in children. When the cyst lies in the inguinal canal, when the soft parts are loaded with fat, and when the patient is a little child, much difficulty may be met with in distinguishing between it and a bubonocele. Attention should be paid to the following points: When the cyst is below the external abdominal ring, impulse will be absent; when it is within the canal, impulse will be less distinct than in the case of a bubonocele, this indistinctness being increased by drawing down the cyst. The swelling can be pushed upwards, but not reduced completely, returning readily, whatever be the position of the patient, and emitting no gurgling when manipulated. Translucency can usually be made out, though in young and fat children this is often a matter of difficulty. In such cases the aids mentioned at p. 117 should always be made use of, and it will be well sometimes to place the patient in the lithotomy position. Finally the defined shape and size of the cyst, together with the absence of any neck, are to be remembered, though Mr. Jordan's case, mentioned below, shows that in little children certainly this last point is not reliable.

The following case of Sir G. Humphry's (*Syst. of Surg.*, vol. v.) is a good instance of an encysted hydrocele which would pass through the external ring, and was mistaken for a hernia, and of the importance of making a right diagnosis in these cases. A boy, aged fifteen, had for some time worn a truss, but found it inefficient. There was an oblong swelling of the right side of the scrotum, not reaching to the bottom of it. The testis and cord were independent of the swelling. It was tenser and larger when the patient was erect; by pressure it was easily pushed up towards the external abdominal ring, and finally passed through it. It then appeared to be reduced like a common hernia, but a close examination showed it to have lodged above the ring, where it formed a distinct swelling. No amount of pressure could carry it into the abdomen, but on discontinuing pressure it reappeared in the scrotum. Its parietes felt and slipped beneath the finger and thumb like a piece of intestine. Fluctuation was indistinct, and coughing imparted no impulse to the swelling, which was translucent. On opening the cyst it was found to be a quarter of an inch thick, and contained about two ounces of fluid. Considerable suppuration followed, but the patient was cured in seven weeks.

Complications.—Like hydroceles of the tunica vaginalis, those in the spermatic cord may be converted into hæmatoceles. The change seems to have been impending in the following case in which the cyst was bilocular, (Krummer, *Rev. Méd. de la Suisse romande*, 1890, t. x. p. 173). In a child, aged three years and a half, the right side of the scrotum presented the dimensions and shape of a small pear, the testicle was normal and could be clearly separated from the swelling, which was smooth, elastic, transparent, and irreducible. When the testicle was dragged on, the swelling followed it in its descent. When the common tunica vaginalis of the cord, which was very thick, was incised, the proper wall of the cyst was reached, and it was found that this could be shelled out from the cord and testicle. The cyst was filled with a turbid reddish fluid, containing red-blood corpuscles and reddish, amorphous pigment. The inner wall was vascular, and presented several patches of ecchymosis and pigment. The cyst was divided into two pockets which communicated by a small opening. In the lower one was a whitish body of the size of a large pea, and composed of fibrin.

The following case (Polaillon, *Gaz. des Hôp.*, 1890, p. 389) also shows the same tendency of an encysted hydrocele of the cord to become a hæmatocele. It is also interesting on account of the age of the patient, the remarkable length of time in which the peritonæal canal, more or less obliterated, had remained patent, and then the formation of hernia.

The patient, aged thirty, had noticed three years before, after repeated hard work, that a small soft reducible swelling had appeared in his right groin. On admission the swelling was somewhat trilobed. The upper part was soft, resonant, reducible, without marked gurgling; the middle portion was smooth, tense, irreducible, dull, and without translucency. Finally, at the lowest part was a normal testicle. Puncture of the central part gave vent to a brownish fluid, and was clearly an encysted hydrocele. This, being lined with false membranes, was treated by decortication (p. 238), and the hernia was submitted to radical cure.

Treatment.—In quite young children the use of evaporating lotions (p. 170), or counter-irritation with tr. iodi or liq. episp., may be successful. If these fail, acupuncture (p. 139) may be tried. Injection with iodine and the use of the seton have been attended with good results, but are, in my opinion, never to be recommended, owing to the uncertainty which must be present as to whether a minute communication with the peritonæal cavity does not exist; or if such a communication be absent, a long thread-like process may run up to and join (though closed) the general peritonæal membrane at the internal ring.*

In all cases, but especially where the cyst is high up and within the canal, an aseptic incision will be found the safer mode of radical treatment, as at this level, from the contiguity of the peritonæum, and from the numerous planes of cellular tissue, any risk of setting up diffuse inflammation is especially to be avoided. Such a course will also give a good opportunity of curing radically any hernia which may be present, or of preventing any such complication by closing as high up as possible, by torsion and ligature, the peritonæal process. If, as may happen in elderly subjects, the cyst is calcified and intimately adherent to the cord, castration had better be performed. In a case recorded by M. Rochè (*Bull. de la Soc. Anat.*, 1889, p. 34) the swelling which had been noticed for fifteen years in a patient at sixty-five was calcified, multilocular, and so firmly adherent to the structures of the cord that an attempt to detach it from them led to sloughing of the testis.

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* Mr. Furneaux Jordan (*Brit. Med. Journ.*, 1877, vol. ii. p. 528) described two cases of hydrocele: one was an encysted hydrocele of the cord connected with the abdominal cavity by a long, fine tube. This would usually be described as a congenital hydrocele. The other was somewhat similar, but the fine tubular prolongation present here ceased at the external abdominal ring.

CHAPTER II.

HÆMATOCELE OF THE CORD.

As in the case of hydrocele of the cord, the effusion of blood here may be met with in two varieties: (α) the **diffuse**; and (β) the **encysted** hæmatocele of the cord. But there is this distinction, the former is the more frequently met with, the reverse of which is the case with hydrocele of the cord, where the encysted form is the more common. Probably the small size and the mobility of the encysted hydrocele account for the rarity with which it is converted into a hæmatocele.

Diffuse Hæmatocele of the Cord.—This is due to rupture of one of the small vessels of the cord, usually a branch of the spermatic vein, into that cellular tissue which at once ensheathes the cord and connects its various constituents, and the fascial envelope of which prevents the hæmorrhage from spreading further laterally.* The rupture is usually brought about by some sudden strain or exertion, more rarely by a blow.† Thus, Mr. Pott (*On the Hydrocele*, p. 134 *et seq.*) relates three cases, in one of which "a young fellow, straining to get rid of a very hard stool, felt a sudden pain in his left groin, and found a swelling extending from thence into the scrotum." In another case, a labouring man, who had fallen down in the street with a load on his back, was brought into St. Bartholomew's Hospital upon a suspicion of a rupture, he having a large swelling in his groin and scrotum, immediately consequent upon his fall. The swelling seemed to occupy the whole cord, which was so enlarged by it that it was impossible to feel where it passed from the abdomen through the muscles; but the testicle below was perfectly distinct. An exploratory incision gave vent to a large quantity of blood, partly fluid and partly grumous, and the whole swelling subsided. The patient recovered.

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* Kocher's experiments, repeated by MM. Monod and Terrillon, show that the course the blood ultimately takes depends on the rate of its escape. Thus, if fluid be injected at a low pressure within the common sheath of the cord, it forms an elongated swelling. If great force be used, the fluid makes its way through the sheath into the sub-peritoneal cellular tissue.

† Mr. Hanley records (*Med. Sci. and Gaz.*, 1853, vol. i. p. 370) a case of diffuse hæmatocele of the cord. After a kick from a horse, a swelling the size of two fists, pyriform in shape, its neck extending into the canal, very tense, with a smooth rounded outline, and feeling equally solid all over, appeared on the left side in the groin and scrotum. It completely concealed the testicle and cord. The overlying skin was distended, and reddish-purple. The absorption of the blood took place very slowly, it being six weeks before it was sufficiently accomplished to allow of the patient being discharged. Even then the cord remained thickened.

The only case which I have seen of diffuse hæmatocele of the cord was produced in an entirely different way by the efforts of a patient to reduce a large inguinal and scrotal hernia which had become strangulated. Here the overlying tissues and the cellular meshes of the cord itself were loaded with dark coagulated blood from the lower third of the canal down into the scrotum. The case did well but very tediously, owing to the entire absence of any primary union in the damaged tissues.

Diagnosis.—The sudden formation, after a strain, of a swelling which occupies the lower part of the inguinal and the scrotal regions, the consequent obscureness of the cord, and, possibly, the resemblance of the feel of the extravasated blood to omentum, may at first sight lead to the suspicion of a hernia; but the fruitlessness of all efforts at reduction with the entire absence, when the case is watched, of any symptoms indicating an irreducible or strangulated condition of the intestine, will serve to prevent mistakes.*

Treatment.—This, at first, should be directed to preventing the onset of inflammation, and to promoting absorption. The latter, owing to the richness of the cellular tissue in lymphatics, will, as a rule, take place. After a trial of the earlier treatment already given (p. 236), flying blisters, counter-irritation, and, later on, well-adjusted pressure by a Martin's bandage, over a mercurial ointment, may be made use of.

When the above fails, or when the tension is very great, an incision with antiseptic precautions should be employed; and as, if absorption does not take place, these hæmatoceles may, owing to the looseness of the cellular tissue, attain an enormous size, this step should not be delayed after a fair trial of palliative treatment. Sir W. Bowman has recorded (*Med. Chir. Trans.*, vol. xxxiii. p. 233) a case of acute hæmatocele of the cord, which illustrates the above point as to size, and is of interest from the history, the changes in the swelling, and its ultimately proving fatal. The patient was about sixty. About ten years before, in a fall from his horse, he had received a blow on the right groin, which gave rise to an inguinal swelling resembling a hernia. It could not, however, be reduced; it gave no impulse on coughing, and was accompanied by ecchymosis. The swelling at first, as large as a hen's egg —oval, firm, and elastic—remained nearly stationary for seven years, when, during exertion in walking, it became suddenly larger and heavier, the scrotum becoming also much ecchymosed. The swelling increasing, it was punctured, and a gush of blood followed. The puncture healed, but the swelling went on increasing until it reached the patella (Fig. 69), rendering the patient bedridden. The testicle was at the lowest part of the swelling, and distinct from it. The fact that the swelling was tympanitic above, and appeared to contain air and fluid, together with the setting in of a low irritative fever, rendered it probable that decomposition had followed the puncture. On laying the swelling open freely, dark-brown putrid treacly blood, together with large masses of old coagulum, escaped, altogether filling two large wash-hand basins. In the patient's weakly condition the removal of the wall of the swelling was not attempted. A counter opening was made at the lower part. The walls, being firm and solid, did not collapse. The patient only survived the operation five days. As no necropsy was made, the source of the bleeding, whether arterial or venous, must remain doubtful.

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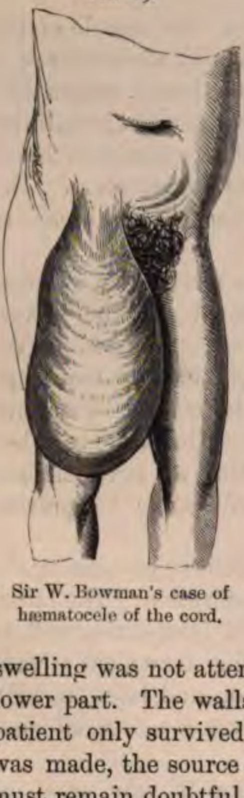
* The superficial extravasation may be so great as quite to conceal that which has taken place within the sheath of the cord.

FIG. 69.



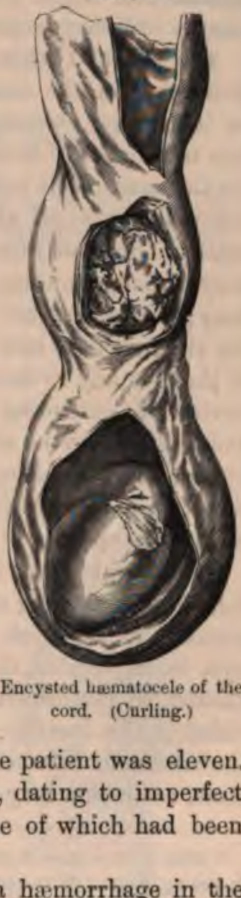
Sir W. Bowman's case of hæmatocele of the cord.

Encysted Hæmatocele of the Cord.—Of this condition there is a good specimen (No. 4292) in the Hunterian Museum (Fig. 70). Here the cyst, lined by a polished membrane, is filled with soft, partly decolorised blood clot, similar to that shown in Fig. 36. There is a hernia above the hæmatocele, and a hydrocele below, a coexistence which suggests the origin of all these conditions in imperfect obliteration of the vaginal and funicular processes of the peritonæum. The hæmatocele is independent of the other swellings.

Origin and Causation.—Encysted hydroceles of the spermatic cord may arise in one of the following ways:—(1) By transformation of a serous cyst, or encysted hydrocele, probably dating to imperfect obliteration of the processus funicularis. (2) In hæmorrhage into the cord which has become encysted. (3) Though this mode of origin is much more doubtful, in inflammatory deposit in the cord (of traumatic origin), which, later on, becomes hæmorrhagic.

(1) Encysted hæmatocele originating in an encysted hydrocele. In these cases the formation of the swelling is usually slow; there is a previous history of a cyst, perhaps of the size of a pea only, in childhood or boyhood. From the friction of the movements of the groin this becomes chronically inflamed, the lining membrane is thickened, and hæmorrhage eventually takes place. This form of hæmatocele usually occurs in boyhood or early adult life. Help may be given in the diagnosis by the presence of another swelling connected with the cord. Thus in a case of M. Gosselin's (*Gaz. des Hôp.*, 1867, No. 17), a man of twenty-eight had on the left side an encysted hydrocele of the cord, while on the right was a hæmatocele of the cord. The two swellings had appeared without any known cause when the patient was eleven. It is probable that both were originally cysts, dating to imperfect obliteration of the processus funicularis, one of which had been transformed into a hæmatocele.

FIG. 70.



Encysted hæmatocele of the cord. (Curling.)

(2) Encysted hæmatoceles originating in a hæmorrhage in the cord which has become encysted. This mode of origin must always be a doubtful matter, owing to the possibility of the existence of a small pre-existing cyst, first brought into notice by the hæmorrhage taking place into it.

The following are the **chief clinical characters** of these hæmatoceles of the cord in whatever way they may have originated. In size they usually remain limited for some time. Thus, a pigeon's or a bantam's egg is a common comparison. When larger they may reach the size of a turkey's egg, an orange, a fist, or a small child's head. This bulk is attained by increase of the swelling in a downward direction. Extension upwards into the abdomen, as in hydrocele *en bissac* (p. 171), has been occasionally met with, but is very rare. It is noteworthy that according to Béraud, encysted hæmatocele of the cord may assume a pyriform aspect,* as is the case in ordinary vaginal hydrocele.

The skin and other coverings are usually natural, save for some stretching in the case of the larger swellings. The hæmatocele, as it enlarges, becomes closely connected with the cord; the vas can usually, save in very large swellings, be made out posteriorly. As the hæmatocele usually arises low down in the cord—*i.e.*, a little below the external abdominal ring (Fig. 68)—and enlarges downwards, it gradually encroaches upon the epididymis and testicle, and may, in long-standing cases, become inseparable from them. This may give rise to great difficulty in the diagnosis, if the patient is seen for the first time late in the case. And the same will be the case if there is any hydrocele in the tunica vaginalis, opening up this cavity and extending upwards near to the swelling in the cord. Points that may be of assistance in these cases are, the existence of a previous swelling, where the mischief first began, in which direction it spread, the detection of testicular sensation, and the result of tapping.

Treatment.—An incision made with antiseptic precautions, followed by turning out of the clots, and, wherever practicable, by removal of the cyst, is the best course. Where removal of the cyst is impossible, decortication of its lining membrane (p. 238) should be performed. Adequate drainage must always be provided in this locality. In some very long standing cases, where the adhesions between the hæmatocele and the cord are extremely close, castration may be unavoidable.

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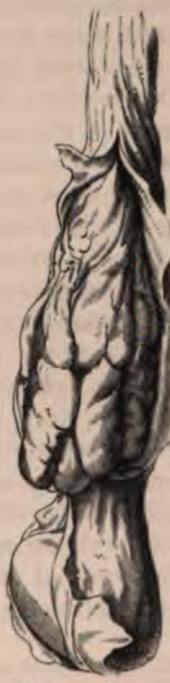
* This is explained in part by the common position of these hæmatoceles—*i.e.*, in the upper part of the scrotum.

CHAPTER III.

NEW GROWTHS OF THE CORD.

As for the sake of convenience *cystic* swellings have been already described under the old and well-known name of Hydrocele of the Cord, only the *solid* growths will now be described. Such growths occurring primarily in the cord are very rare. They are chiefly of the connective-tissue type—viz., lipomata, sarcomata, myxo-chondro-sarcomata, myxomata, fibromata, myxo-fibromata, myomata. It is doubtful if there be a well-authenticated case of primary carcinoma of the cord. Lipomata and sarcomata are much the most frequent.

FIG. 71.



A lobulated fatty growth, surrounded by a thickened sheath of the spermatic cord, resembling very closely omentum in a hernial sac. (Curling.)

Lipomata.—These are important on account of their relative frequency and the closeness with which they may resemble omental hernia. The **origin** of these growths seems to me to be twofold—(*a*) From the extra-peritoneal fat. Mr. J. Hutchinson, jun. (*Path. Soc. Trans.*, vol. xxxvii. p. 451), takes this view, as in the cases he has dissected it was quite easy to trace the fat up into direct connection with that outside the peritonæum. (β) From some fatty tissue found within the cord, especially in young subjects, perhaps the persistent relics of a fœtal state. I have been often struck when operating on cases of varicocele, or for retained testis (each operation being most common in young adolescents), at the frequency with which soft lobules of fat are met with within the cord, a condition which is certainly very rare in the case of older patients, when we are dealing with the cord by castration, or when they are examined in the dissecting-room. While in the majority of cases the fat within the cord disappears, in others, I imagine it may develop into lipomata. Another question, of greater importance even than their origin, is, whether having travelled down the inguinal canal they can produce hernia by drawing down a pouch of peritonæum. That this occurs occasionally is certain, as in two cases which Mr. Hutchinson dissected empty pouches were found, one four inches long, above the lipomata. M. A. Broca, commenting on Mr. Hutchinson's paper, and allowing the origin of these lipomata in the extra-peritonæal fat and their tendency to travel down the canal, denied that any adhesions existed between these growths and the peritonæum, or that the latter was at all drawn down even when the lipoma reached as far as the testicle. M. Broca admitted that by dilating the canal these lipomata might predispose to hernia, but denied that they acted by traction (*Bull. de la Soc. Anat.*, 1888, p. 125). M. Delbet (*Bull. de la Soc. Anat.*, 1888, t. ii. p. 924) showed two lipomata of the cord, both of which were adherent to the peritonæum. When one of these was dragged upon it was seen that the peritonæum was depressed. While from the recorded cases the rarity of a coexisting hernia is remarkable,* the above cases show that in some of these lipomata there is an intimate connection with the peritonæum.

Symptoms.—These lipomata form elongated swellings with rounded outlines, soft, sometimes almost fluctuating. They are mobile but not reducible; their feel closely resembles that of omentum. Even when they descend as low as the testicle, this body can usually be made out below and behind. When their upper extremity extends into the canal, it may be impossible, especially in fat subjects, to decide whether they have a neck continuous with the contents of the abdomen, a point generally given as diagnostic of omental hernia. While the same soft, inelastic, doughy feel, elongated form,† and indolent character are present in both irreducible omental hernia and lipomata of the cord, in the latter the lobulation and size of the lobules is better marked, the impulse on coughing is less distinct, and probably in a patient of any intelligence with an irreducible omental hernia there will be a history that at first the swelling was reducible. Further, in lipomata, the increase is progressive, while epiploceles either remain stationary or increase suddenly in size. In the latter also the cord is more distinct from the swelling.* In one case related by Mr. Curling the patient stated that his left-sided lipoma became heavy and uneasy on his getting up in the morning, and more tense and also painful before an evacuation, "but afterwards resumed its former state." This puzzling sympathy between the bowels and the lipoma may be explained by the swelling in this case having caused pressure on the spermatic veins, and thus tension and uneasiness whenever the patient assumed the upright position, and when the sigmoid flexure was loaded (Curling).

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* M. Broca quoted (*loc. supra cit.*, 1888, t. ii. p. 881) a case of M. Segond's in which by the side of a hernial sac there descended a lipoma of the cord. In another case which he mentioned the presence of lipomata in other parts of the body aided much in the diagnosis.

† Occasionally a lipoma of the cord forms an elongated but a smaller and distinctly defined swelling. Such a condition is seen in Spec. 4293 Hunt. Mus. The lipoma, consisting of numerous lobes of soft fat, is embedded in the tissues of the cord, and loosely connected with them; it measures about 4 inches in length.

Myxo-Lipomata.—This is an extremely important variety, or, perhaps, rather a degeneration, of lipoma, which will naturally lead up to the more distinctly malignant growths of the cord. Mr. Curling's case above quoted was of this nature. A lipoma of the left cord was operated on five times in twenty-one years. It recurred persistently *in situ*, and was dissected out each time. The patient died after the last operation (twenty-four years after the original appearance of the growth). Examination of the growth removed showed that it contained embryonic connective tissue, and thus was allied to the sarcomata. Mr. Targett has published (*Path. Soc. Trans.*, 1889, p. 282) a case in which a large myxo-lipoma of the right spermatic cord had been removed by Mr. Bryant. The swelling measured vertically seven inches; it was soft, heavy, fluctuating, and not translucent. It had been present five years, growing at first slowly, but latterly more rapidly. As it was found on exploration to have involved the testicle, castration was also performed. The wound suppurated, a quantity of liquid fat was discharged with the pus, and the patient died of peritonitis.

The other growths of the cord are **sarcomata** or **allies of**

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* Mr. E. Watson (*Lancet*, 1885, vol. i. p. 837) thinks that these lipomata may be diagnosed from hernia by their being absolutely painless and free from the dragging feeling so common in epiploceles. With regard to impulse this is present while the lipoma is small and high up in the canal, but is lost as it descends by its weight towards the scrotum. Pulling on the cord may bring the lower part of a lipoma into reach.

the sarcomata. These are **fibromata, myxomata, myxo-chondro-sarcomata,** and **myomata.** For the sake of brevity, they will be considered together.

(1) **Fibromata.**—These are very rare. Brouard, in a valuable paper (*Arch. Gén. de Méd.*, 1884, t. ii. p. 267), quotes one from Poisson, in which the growth seems to have sprung from the origin of the vas deferens at its junction with the tail of the epididymis. It was composed of fibrous tissue, in which much fatty degeneration had taken place. Castration was performed, and it is stated that no recurrence followed.*

Mr. E. Watson records (*Lancet*, 1885, vol. i. p. 838) a case of fibrous growth of the cord, which is of interest both in its diagnosis and treatment. A man, aged forty-four, when admitted into the Glasgow Royal Infirmary, stated that he had had a rupture on the right side for many years. It was small and reducible at first, but about seven years before it greatly enlarged, and gradually descended into the scrotum, where it still further enlarged. The patient averred that even then it was reducible when he was in bed. He wore a truss which did not keep up the swelling. For eighteen months the swelling has been irreducible, hard, but painless. On admission, the swelling was about the size of a large pear, the thin end passing up into the canal, while the bulk of the swelling occupied the scrotum. The skin over it was red and œdematous, the swelling was quite irreducible and without impulse. Mr. Watson explored the swelling, and found it covered by the sheath of the cord and closely adherent to it and the testicle. There was no fluid in the sheath, and the swelling was with difficulty separated from the adjacent parts. The neck was enclosed in the canal and adherent to it all round, but gave no sign of passing into the abdomen. Fully one-half of the canal was laid open to make sure of this point, and Mr. Watson, being satisfied that he had only the fibrous neck of the swelling to deal with, transfixed it with a chromic gut ligature and cut the tumour away, having succeeded in saving both cord and testicle from injury. The patient made a good recovery. The tumour was found to be fibrous in structure, hard and solid in its entire extent; on microscopical examination, the fibres were found separated here and there by small masses of fat.

Myxomata.—I can find no recorded case of a pure myxoma which has been submitted to the requirements of modern histology.

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* It was found that the preponderating tissue was myxomatous.

Le Sauvage has described (*Arch. Gén. de Méd.*, 1845) two cases which were apparently myxomatous. Thus, the growths were glutinous, homogeneous, of feeble consistency, and elastic: one, on account of its apparently distinct fluctuation, was taken for a cyst; one recurred fatally four months after the operation.

Several cases of myxomata combined with other growths have been recorded. Two instances of **myxo-lipomata** have been mentioned above, p. 515. Mr. Pepper has given (*Path. Soc. Trans.*, vol. xxxvi. p. 297) an interesting account of a myxo-chondro-sarcoma. The patient was aged seventy-five. The growth began near the external ring, and, after growing continuously for ten months, weighed a pound on removal. The testicle was apparently fixed to the growth, but was found afterwards to be free. The inguinal canal was much dilated, the skin over the growth stretched but not infiltrated. Fluctuation, present at one or two places, was due to some cysts which formed an essential part of the growth. No infection of the lumbar glands or viscera could be detected. The growth was removed, together with the testicle and cord; the wound healed, but the patient died after many days of wild delirium. There was no necropsy. A section of the growth showed a gelatinous, quivering appearance, with here and there a whitish strand of sarcomatous tissue. Microscopically the growth consisted of myxomatous tissue with occasional lines of round and spindle cells, and microscopical islets of cartilage.

Mr. Walsham recorded (*Path. Soc. Trans.*, vol. xxxi. p. 291) a case of **myxo-sarcoma** of the cord, the chief interest of which lay in its being one of those very rare cases of malignant disease of the cord which have occurred in early life. The patient was a child aged thirteen months. The swelling was situated partly in the cord, partly in the scrotum. It had been noticed six weeks. It was of the size of an orange, smooth, circumscribed, elastic, non-translucent, and giving the feel of a very tense cyst. The veins over it were dilated. The growth was removed (by Mr. Anderson, of Nottingham) together with the testicle and cord. It was found to be clearly connected with the cord about half an inch above the testicle. It consisted of myxomatous tissue and mixed sarcoma cells. A year after the operation there was no recurrence.

Sarcomata.—These have been met with in the cord quite independently of any growth in the testicle; they grow rapidly, and the lumbar glands are always infected when the growth has lasted several months. They also invade the parts more immediately adjacent, and by thus spreading to the extra-peritoneal fat may reach the peritonæum, and the abdominal viscera.

The following cases show points of importance which may be met with in sarcomata here. Mr. C. Mansell Moullin (*Path. Soc. Trans.*, vol. xxxvii. p. 341) recorded a case of a sarcoma of the cord in a patient aged thirty-two; it had grown rapidly, and in one point simulated closely encysted hydrocele, fluctuation being perfect. When tapped it was full of dark grumous blood. The blood-vessels were much enlarged. When examined the interior of the growth was lined with old blood clot as in a blood-cyst. It proved to be a spindle-celled sarcoma.

M. Lemarque published (*Ann. de Mal. des Organ. Génito-urin.*, 1888, t. vi. p. 208) the case of a man, aged thirty-four, who for about six months had had a small rounded growth at the orifice of the external ring. When the patient was lying down nothing could be felt; when he coughed a small ovoid mass impinged against the finger. When he stood up a swelling resembling an atrophied ectopic testicle could be seized. At the operation, a growth was found of the size of a pigeon's egg situated in the midst of the spermatic veins, contained in a kind of sac, and sending a diverticulum up the canal, but having no connection with the peritonæum. It proved to be a spindle-cell sarcoma.

The following case (G. W. Mason, M.D., *Med. News*, Philad. 1883, vol. xliii. p. 554) was complicated with hernia and inflammation. The patient, aged forty-one, had noticed for one year and a half a swelling where the cord emerges at the external ring. As he had been the subject of a direct inguinal hernia, prolonged taxis was applied. Dr. Mason found a swelling extending along the cord to the testicle; the latter was movable on the lower end of the swelling. The swelling itself was hard, hot, and tense. There was no impulse on coughing; the swelling could not be reduced. Next day there was fluctuation, and an incision let out four ounces of pus, leaving a cup-shaped tumour. As at the end of two weeks an indurated swelling, the size of a hen's egg, still persisted, this was explored, and being found to be a fibro-sarcoma was removed, together with the testicle and cord. During the operation the vermiform appendix was removed. The source of the pus is not clearly stated. The patient recovered, but the last note states that recurrence *in situ* was probable.

Finally, the following case, which was probably sarcomatous, shows how large these cases may occasionally become. Mr. Spence (*Edin. Med. Journ.*, 1856, p. 750) removed a large "medullary"* tumour weighing nearly six pounds. It showed itself first, about two years before, at the external ring, and gradually increased, more rapidly latterly. It was found necessary to slit the aponeurosis of the external oblique, and clear the cord high up. The growth was fully removed; but sloughing and suppuration, followed by peritonitis, supervened, and the patient sank. The testicle was free from disease.

Myomata.—These, or perhaps more correctly speaking, fibro-myomata have very occasionally been met with arising in the smooth muscular and fibrous tissue of the vas deferens. When they arise near the origin of this tube it may be impossible to tell them from growths of the epididymis.

Treatment.—Whatever be its nature, a growth of the spermatic cord should be removed as early as possible, if the general condition of the patient admits of it; even if it be a lipoma only, it will, ultimately, by its size become a source of much inconvenience, and when it thus requires removal, may be found to have contracted adhesions to important parts, cord, testicle, peritonæum, &c. To get away its upper end it may then be needful to slit up the aponeurosis of the external oblique and thus weaken the inguinal canal. When there is any doubt about the fixity or nature of the growth, leave to perform castration should always be obtained. Where the growth is of doubtful nature, rapid growth, and, at the time of the operation, much vascularity and disappearance of the normal constituents of the cord (the vas only being recognisable), will be important features. Where adhesions or probable malignancy require it, the canal must be slit up, and the cord dragged down as far as possible. The strictest antiseptic precautions must be taken, including adequate drainage. When the canal has been slit up, buried sutures of chromic gut should be employed.

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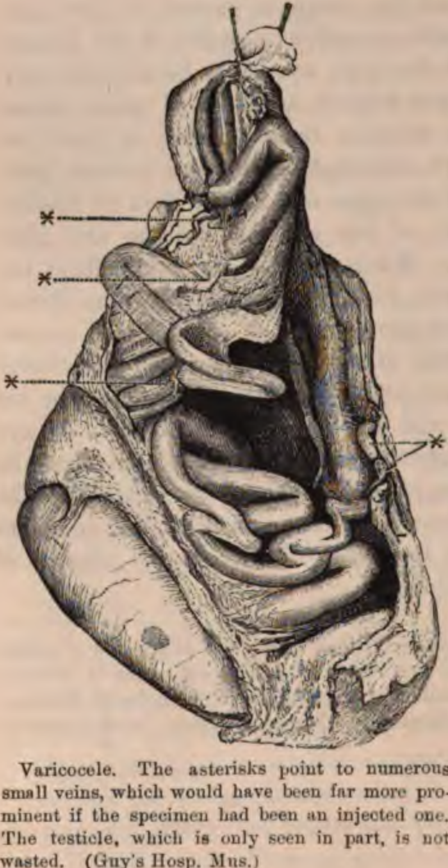
* Two specimens in the Hunterian Museum (4294 and 4295) show a similar disease. In one the mass is oval and nearly 6 inches long, in the other in the whole course of the cord are medullary tumours from 1 to 3 inches in diameter. The lumbar glands and the omentum are likewise affected. In each case the testicle was healthy.

CHAPTER IV.

VARICOCELE.

THIS disease consists in a varicose enlargement of the veins of the pampiniform plexus, and of those of the lower part of the cord.* If the milder degrees of the affection which scarcely constitute a disease are included, varicocele is one of the commonest of the disorders of the male genitals. Sir G. Humphry considered that varicocele is met with in about one male adult in ten. But if only the more marked degree of varicocele, which is alone worthy of the name of disease, is meant,† the frequency will be much less. Mr. Bennett (*On Varicocele*, p. 2) puts it at five or six per cent. The condition is infinitely more common on the left side, a fact to which Morgagni drew

FIG. 72.



Varicocele. The asterisks point to numerous small veins, which would have been far more prominent if the specimen had been an injected one. The testicle, which is only seen in part, is not wasted. (Guy's Hosp. Mus.)

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* Enlargement of the scrotal veins, and of the dorsal vein of the penis are alluded to later on.

† As the degree of varicocele which is deemed important enough to reject candidates for the Army and Navy certainly varies with different examiners, I have not given the large

attention. Breschet (Landouzy, *Du Varicocele*, p. 24) had only seen one case in which the varicocele was on the right side. Mr. Curling held that the disease was far from being so rare on the right side as was generally supposed, and that it often existed on both at the same time, though the varicose state of the right veins is nearly always much less than that of the left.*

Pathological Anatomy. Condition of the Veins.—It will be well, here, to give a glance at *the normal condition.* Cruveilhier, whose accuracy is well known, describes the spermatic veins as commencing inside the testicle, where, after traversing the tissue of the gland, they are applied to the inner surface of the tunica albuginea in the tunica vasculosa. After perforating the tunica albuginea they are soon joined by the veins of the epididymis, so as to form a plexus, which communicates with the dorsal vein of the penis, and with the external and internal pudic veins. The spermatic veins soon unite into five or six trunks which pass up in front of the vas deferens. These veins are tortuous, and divide and anastomose, so as to form the spermatic pampiniform plexus. Passing into the inguinal canal, the branches from this plexus join in two or three veins, and these again unite into a single vessel, which, leaving the vas deferens, accompanies the spermatic artery and spermatic nerves along the psoas behind the peritonæum, and terminates, on the right side, in the vena cava, on the left, in the renal vein. The spermatic veins sometimes bifurcate before their termination, one branch ending in the cava, and the other in the renal vein. The right vein sometimes opens both into the cava and the renal vein. Cruveilhier states that the spermatic veins communicate, soon after leaving the testicle and epididymis, with the dorsal vein of the penis and the branches of the internal and external pudic veins. He also states that higher up they sometimes communicate with some branches of the portal system. Mr. Bennett (*loc. supra cit.*, p. 19) has amplified this with some interesting details. "The left vein, always longer and larger than the right, receives one or more, generally two, branches from the descending colon. These colico-spermatic branches, which communicate with some radicles of the portal system, vary greatly in size in

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statistics taken from the recruiting reports of the Army Medical Department. Mr. Curling, taking ten years, puts the number rejected on this ground as 23 per 1000; Mr. Bennett at from 13 to 19 per 1000 of recruits examined.

* Of 5639 recruits rejected for varicocele in about seventeen years, 4881 had the disease on the left side, 344 on the right, and 414 on both sides.

different individuals. . . . . They are normally confined to the left side."

The *presence of valves* has been much disputed. Some writers—*e.g.*, Landouzy—deny their existence; others admit their presence, but in an incomplete form, and thus one insufficient to oppose the reflux of blood (Richet). According to other writers, the development of the valves varies in different subjects. Thus, M. Périer thinks that his dissections prove that the valves of the spermatic veins are in their number and development in relation with the muscular vigour of the individual, and, perhaps, more particularly with the development of the abdominal muscles and the cremaster. Mr. Bennett considers that the valves in the plexus and the veins are uncertain in number and situation. The termination of the veins, the left at a right angle in the left renal, and the right in the vena cava obliquely, or almost parallel to the axis of that vessel, have been handed down by writer after writer as important factors in the frequent production of varicocele on the left side. Another point, which has been much disputed, is, the existence of valves where the spermatic veins thus join the main circulation. It may be taken for certain that valves either exist here at the mouths of the spermatic veins, or a little lower down below their mouths.*

In a varicocele the veins, especially those of the pampiniform plexus, are dilated, elongated, more tortuous than is normal, and much increased in size and also in number, owing to dilatation of many smaller veins; they are also arranged in markedly flexuous curves and loops. These loops show all of the three varieties of permanent distension which are met with in varicose veins—viz., the cylindrical (the commonest), the fusiform, and the saccular.

The above changes are most marked just above the testicle—*i.e.*, for the first two inches; higher up, the varicocele usually tapers away beyond the external ring. In a large varicocele the varicose condition of the veins not only begins above the testicle, but enlarged veins hang down below it and over it (Fig. 73); in some of these cases they even conceal the gland. The presence of the soft worm-like coils of these last-mentioned veins must always be excluded or allowed for before the state of the testicle can be estimated. Fig. 74 shows a specimen dissected by Mr. Curling, in which the varicose veins were arrayed in three clusters. One, formed of the larger vessels, proceeded from the lower end of the testicle; the second, in which the vessels were less in size, but more numerous and tortuous, arose from the upper end; whilst the third and smallest cluster accompanied the vas deferens. The veins with the vas deferens are, in my experience, always the least affected.

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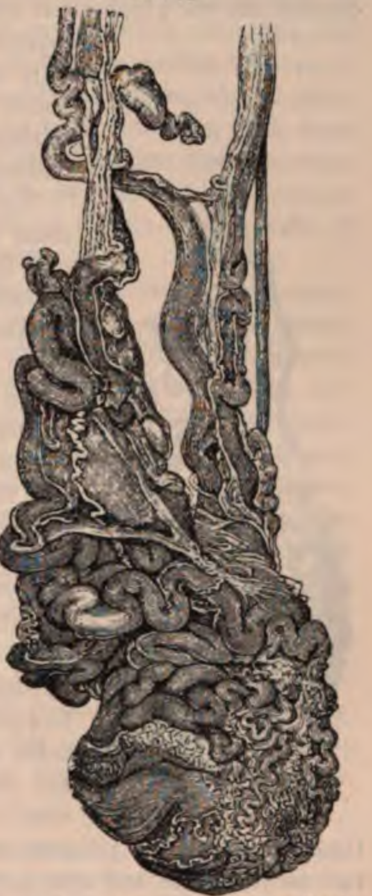
* Thus Prunaire, having examined the spermatic veins in twelve subjects stated that the right spermatic vein generally has a pair of veins at its opening into the cava. The left spermatic vein had a pair of valves at its opening into the renal vein in eight out of the twelve cases. In the other four they were wanting, but were found three centimetres lower down. Another pair was found at the internal ring. Several existed between this point and the testicle on both sides, so that in the course of the vein there were from six to eight pairs of valves. Mr. Rivington, who examined these points for Mr. Curling, met with similar results. He also noticed that when no valves existed either at the orifice, or a little below the orifice, of the left spermatic vein, valves were present in the renal vein within half an inch of the opening.

While the above condition is usually most marked in the pampiniform plexus, even the veins in the testicle itself are varicose, and enlarged veins may often be distinctly seen ramifying between the tunica vaginalis and the tunica albuginea (Curling).

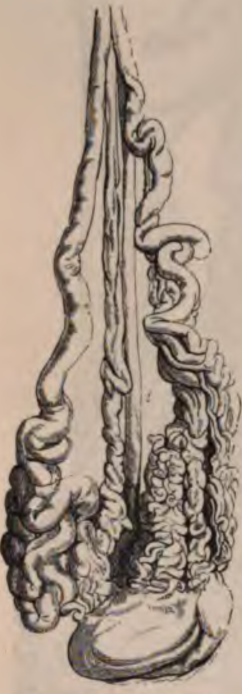
FIG. 73.



Varicocele. A great number of small veins surrounding the testicle below are well seen, p. 526. Above, a few branches of nerves are seen together with lymphatics. (Osborn.)

With regard to the question whether varicocele affects the veins within the inguinal canal, or the spermatic veins themselves, the answer has usually been in the negative. As varicocele is a disease which tends to disappear after a time—*e.g.*, after thirty or thirty-five—and as even in the subjects of varicocele the recumbent position and empty condition of the veins before and after death make it very difficult to estimate the degree of varicocele present during life—there are very few reliable observations on this point. Mr. Bennett (*loc. supra cit.*, p. 23) states that in one variety* of varicocele the tortuosity and dilatation may extend inside the abdomen. From the great relief given, in the large majority of cases, by simple treatment, and from the decided success which often follows operative steps, which are of course limited to the lower accessible part of the cord, extension of the varicocele within the canal, and, *à fortiori*, within the abdomen, must, I think, be extremely rare.

FIG. 74.



Varicocele. (Curling.)

The dilated veins are somewhat thickened in long-standing cases, this being due, in part, to additional fibrous tissue of inflammatory origin, and, in part, to compensatory thickening of the muscular tissue. It is this thickening of the veins which enables them to stand open, when cut across, like arteries. Mr. Bennett, who denies the influence of chronic inflammation in bringing about this thickening of the veins, attributes it, with very few exceptions, in which thrombi, &c., have occurred, to a congenital cause—viz., to "the same tendency to abnormality which produces the increased size and tortuosity—for it will be found that, however young the subject may be, the veins on the affected side are distinctly not only larger but thicker in structure than natural." While the absence of thrombosis and its products is, apart from inflammation, very rare in varicocele, and thus one explanation of the thickening of the veins is absent, this absence is in part to be explained by the very free communications between the varicose veins. I do not think chronic inflammation can be denied in veins so superficial and so repeatedly subjected to handling in the case of many over-anxious patients.

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* Mr. Bennett describes (*loc. supra cit.*) four varieties of varicocele. He states that the junction of the two or three branches proceeding from the pampiniform plexus to form the spermatic vein may take place at any point between the level of the external ring below and the middle of the iliac crest above, further that the pampiniform plexus is for practical purposes divided into two distinct parts, an upper and a lower, by a central complicated plexiform arrangement. Above and below this, though the veins communicate with each other, the arrangement is in many cases hardly sufficiently intricate to justify the use of term "plexus." The varieties of varicocele are as follows:—(1) The

Diminution of the elasticity and contractility must follow on the above changes in the coats. This chronic inflammation of the veins and the share it may play in producing varicocele will be again alluded to later (p. 530), under the heading "Causes of Varicocele." Thrombosis has been already spoken of, and phlebolithes are described as frequent. I have never met with them in the living subject. MM. Monod and Terrillon draw attention to a point which is very important if correct, that the presence of phlebolithes may so alter the feel of a vein as to make it possible to mistake it for the vas deferens.

Condition of the Testicle.—This is an extremely important question, for if it could be shown to be the case that serious wasting of the testis is common in varicocele, frequent operative interference would be largely justified. Unfortunately this question is much disputed. To give two weighty instances only. Sir J. Paget writes (*Clin. Lects. and Essays*, p. 274): "I do not believe that it ever produced wasting of a testicle, or impotence, or any such thing." On the other hand, Mr. Curling's opinion was as follows: "A softening and partial atrophy of the gland has come under my notice in numerous instances." He then relates cases in which extreme atrophy of the testicle appears to have been produced by a varicocele (p. 524). Writing in 1881 (*Syst. of Surg.*, vol. iii.) I stated my belief as follows: "Save in varicoceles of very large size or rapid formation,* serious atrophy of the testis is not to be feared in this disease." The past ten years have entirely confirmed this opinion. The varicoceles

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whole of the pampiniform plexus and its efferents are involved; if therefore the formation of the spermatic vein, the junction of the efferents, takes place at a high level, the varicocele may extend within the abdomen. (2) The varicocele may be limited to the lower part of the pampiniform plexus, the veins in the upper part of the cord being slightly larger than usual, but otherwise not abnormal. (3) The varicocele involves more especially the upper part of the plexus extending up to the point of formation of the spermatic vein. (4) The whole pampiniform plexus and spermatic vein may be much larger and more tortuous than normal. A useful clinical classification of varicocele by Mr. Bennett is given at p. 528.

* Atrophy may follow, though very rarely—*i.e.*, those varicoceles which are due to an injury of the pampiniform plexus. It is quite possible that a phlebitis may be here set up which, if neglected, will cause permanent closure and shrivelling of too many of the veins to be compatible with the nutrition of the testis.

which make me most anxious as to the future of the testicle are those in which a large number of varicose veins, situated low down, surround the testicle, sometimes weighing it down into the horizontal position. There is no doubt that the testis on the affected side often feels smaller and softer than its fellow. But this, save in some patients' imagination, does not constitute permanent atrophy. It is obvious that if, in a dependent part, like the testicle, the veins become dilated, the naturally slowly moving venous blood (p. 20) will be at a still greater disadvantage, the venous radicles will be loaded, the arterial supply will have a difficulty in reaching the arterioles, while the blood in the capillaries not being removed and relieved as it should be, the nutrition of the gland will suffer, the epithelial cells undergoing fatty degeneration, and the connective tissue shrivelling. Thus, it must be allowed, in a very small proportion of varicoceles, such as those mentioned above, whose owners neglect to seek or to follow advice, it is possible that marked atrophy may follow. In private practice, where cases are seen early, and where the patient follows the advice given, such a condition is practically unknown.* That the diminution in size, the softness and apparent loss of elasticity and plumpness, which are met with in all ranks of life, are only temporary, and that they do not, in a very large proportion of cases, lead to atrophy, is shown by the facts that after marriage, or when the sexual desires begin to diminish, the varicocele retrogrades spontaneously, while any anxiety and mental worry disappear also. Again, varicocele in old men is one of the rarest facts in surgery, though a varicose condition of certain neighbouring venous plexuses is common and well known.

One more point must be mentioned with regard to this subject. While varicocele sometimes occurs in the robust and healthy, there is no doubt that very many of the patients who come with the common small or moderate varicocele and fancied "dwindling away" of the testicle, are themselves feeble and delicate, or, if they present a well-marked masculine exterior, they are very deficient in manliness of mind.

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* This is probably the explanation of the above want of agreement between the opinions of Sir J. Paget and Mr. Curling. Where writers mention these cases of marked atrophy which are occasionally met with, they are not sufficiently careful in specifying whether they occurred in hospital or private practice. I may here give a hint to my younger readers that in estimating the supposed effect of a varicocele upon the testicle, several fallacies must be remembered. To begin with, one testicle is, quite apart from any varicocele, often smaller than its fellow. Mere softness is not to be taken for atrophy. A testis that is really as large as its fellow may appear smaller, because it is surrounded, and in part concealed, by veins (Fig. 73). In some cases of atrophy with (not *from*) a varicocele, syphilis may be the cause.

Causation.—Here, as in all conditions whose origin is obscure, the hypotheses are very numerous. While I shall mention many of them, I will say at once that we are not yet in a position to give, decisively, an explanation that will apply completely to the majority of cases of varicocele. We know, to begin with, that there are certain conditions connected with the spermatic veins and the circulation of the testicle which predispose to varicocele. Thus the veins are naturally somewhat tortuous, they anastomose freely, they run, below, in loose tissue, which affords but little support, while, above, they pass through the inguinal canal, where they are liable to be frequently subjected to pressure during the action of the abdominal muscles. A final point in which the circulation of the testicle is manifestly different from other secreting organs, is the great length, and at the same time the small calibre, of its afferent and efferent vessels. But while, owing to the great length and small calibre of the spermatic artery, the entrance of arterial blood will be somewhat delayed, and so perhaps any over-secretion of seminal fluid prevented, the same result of length and small size in the case of the spermatic veins (though here the calibre increases somewhat) must make the escape of blood relatively slow and under feeble pressure. But the slower the current and the more ill-supported the veins in which this column of blood, but feebly supported *a tergo*, is moving, the more powerful is the influence which any added disturbance, no matter how trivial, if repeated or continuous, may bring about in parts like these. So far, in recognising the existence of **natural predisposing causes,** we tread on firm ground; beyond this point all, or nearly all, is hypothesis.

The fact that varicocele, quite differently from other varices, usually first appears between the years of puberty and adolescence, the healthiest and strongest years of life, points, I think, strongly to the probability that the changes connected at these times with the growth and development of the sexual organs, falling as these changes do on veins naturally disposed to varix, somehow bring about an actual condition of varicocele. But why this disease actually occurs in few, while the predisposing conditions exist in all, is at present quite unknown.*

I shall next mention some of the chief causes of varicocele which have been suggested, and then the explanations of the great frequency of the disease upon the left side.

Mr. Bennett (*loc. supra cit.*, p. 33) divides the causes of varicocele into (1) originating and (2) contributing. Of the (1) originating causes he writes: "One cause only is concerned in the actual origin of the affection—viz., congenital abnormality or malformation in the spermatic venous apparatus." Mr. Bennett brings forward the following points in support of the congenital origin of varicocele: (a) *The accidental discovery of the majority of varicoceles in a well-developed stage*; (b) *the early age at which fully developed varicoceles are discerned.* In support of this, three cases are mentioned of well-marked varicoceles in boys five, seven, and eight years old. (c) *The state of the testicle*, which in some cases has been arrested at a very early period in life. (d) *Results of dissection.*—Two cases are given, one in a boy under four years of age, and the other a fœtus, in which the left spermatic vein and plexus were unusually large and tortuous. (e) *Heredity.*—In 100 cases there was a distinct history in about 50; in 30 of these the history pointed to varicocele; in the remainder to varix of the lower extremity. (f) *Frequent co-existence of other vascular abnormality.*—"At least 85 per cent. of persons coming under observation with varicocele present evidence of varix in other parts, scars of old nævi, &c."

The proportions in which the last two factors in the production of varicocele were met with by Mr. Bennett, will seem to most surgeons extremely large.

Of the second group or contributing causes, the two following are given by Mr. Bennett:—(a) *Growth about the time of puberty*; (b) *Growth at periods other than that of puberty.* The same writer holds that the liability of varicocele to increase after puberty must depend, to a great extent, upon the direct connection of the spermatic vein with the portal system, by means of the colico-spermatic veins which he has described (*vide supra*, p. 521), "For though these vessels vary greatly in different subjects, they are large enough in some to allow of any engorgement or obstruction of the portal circulation to throw increased pressure upon the spermatic veins."

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* Nélaton put this date between the years of fifteen and twenty-five, Hélot between ten and thirty. Of 50 cases Curling found that the disease was first noticed between the years of fifteen and twenty-five in 26 cases, between those of twenty-six and thirty-five in 14 cases, between thirty-five and sixty-five in only 8, and before the age of fifteen (ten to fifteen) in only 2. As bearing on the influence of age, Nélaton (*Gaz. des Hôp.*, 1858, No. 88), in every 50 pupils of the military schools of Paris, saw 1 to 2 varicoceles; on the other hand at Bicêtre he hardly saw one case in 5000 old men. Horteloup found the proportion higher at this latter institution—viz., 42 cases of varicocele in 1600 old men: of these 42 cases, 16 had begun before the age of twenty-five.

Allied to the congenital causation given by Mr. Bennett is the very ingenious view put forward by Mr. Spencer (*St. Barth. Hos. Rep.*, 1887, p. 137). He argues on the following grounds that varicocele originates in a persistence of fœtal veins. The spermatic plexus is of relatively large size in the fœtus. In due course most of these large veins should be completely involuted in early life; but if this fail to take place, and some of the large veins of the plexus remain still patent but collapsed—that is to say, in a potential state—then, towards puberty, the natural conditions due to the increasing vascularity may tend to dilate these collapsed but still patent veins. Varicocele thus originates, not in any anatomical condition, but as a result of the natural conditions obtaining at puberty, acting on persistent fœtal structures. As Mr. Spencer allows, the gap in his argument is evident. Persistent veins in boyhood have not been described, but this is, perhaps, because they have not been especially looked for. Why fœtal structures should persist in one case and not in another—*e.g.*, why a varicocele or a dermoid cyst should occur in one person and not in another—it is impossible at present to say.

Mr. Pearce Gould (*Clin. Soc. Trans.*, vol. xiv. p. 80) holds that some varicoceles at all events are not the result of a yielding of the veins to internal pressure, but are produced by a primary growth of venous tissue—are, in fact, venous hypertrophies. He holds that the pampiniform plexus from its striking arrangement shows some special tendency to the development of veins just at this spot in the embryo, and that at puberty, when the testicle is undergoing its full development, these veins again take on active growth, and overstep the limit between the normal and the deformed.

Other writers hold that prolonged standing and excessive action of the abdominal muscles are powerful causes of varicocele. M. Gaujot has drawn attention to the frequency with which varicocele develops rapidly in young French recruits. He explains this by the prolonged and frequent standing, the compressing effect of different parts of the uniform, and the muscular exertions required in the performance of different frequent drills,

&c. The objections to this explanation are that varicocele is met with in patients with widely different occupations, sedentary and active, and that, according to this view, it should occur more frequently on both sides. Finally we do not know how far contraction of the abdominal muscles is baneful, and how far, like that of the muscles of the lower extremities on the intra- and inter-muscular veins, it may be of positive assistance.

Some French writers attach much importance in the production of varicocele to a chronic meso-phlebitis* by which the walls of the veins become inflamed and altered. It is easy to see how the spermatic veins, if thus once structurally weakened, would dilate and become varicose, owing to their being naturally so ill-supported, but of the existence of any such meso-phlebitis, as a primary condition, there is no evidence whatever.

If we turn from the general causes of varicocele to the explanations put forward of the fact that the disease is infinitely more common on the left side, we find very little knowledge that is really accurate and reliable. Here again we have to deal mainly with guesses and hypotheses. The chief of these are:

(1) The compression of the left spermatic vessels by the contents of the sigmoid flexure. Writing twelve years ago (*Syst. of Surg.*, vol. iii.) I pointed out that this has been much exaggerated, as varicocele commences about the time of puberty and adolescence, when constipation is, in boys and men, but little troublesome. Again, in those cases when we operate on hæmorrhoids in males under forty who have suffered from habitual constipation, we do not find that they have been troubled with varicoceles. (2) The greater length of the left vein owing, above, to the entrance of the spermatic vein on this side into the left renal, and below, to the fact that usually the left testicle hangs a little lower than its fellow. This very slight difference, amounting as it does to only three centimetres, is perhaps the most important, if any of the causes can be called important, but it seems scarcely sufficient to account for the very great frequency with which varicocele is met with on the left side. (3) The entrance of the left spermatic vein at a right angle into the left renal. The objections to this hypothesis which has been handed down from writer to writer appear to me to be as follows. If it were valid, left-sided varicocele should be far more frequent than it is. It would be contrary to all the

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* MM. Monod and Terrillon, *loc. supra cit.*, p. 756; P. Segond (*Dict. de Méd. et Chir. prat.*, t. xxxiii. p. 253).

teaching of teleology that such an arrangement as this should produce and cause a disease. Finally, any one who has dissected the branches of the vena portæ must remember instances where branches of this vein—*e.g.*, the inferior mesenteric at its junction with the splenic—are constantly arranged at a right angle to the main blood current, but no one accuses this arrangement of playing an important part in producing piles. The existence and the arrangement of the valve at the mouth of the left spermatic vein has been already alluded to at p. 522. (4) Many French writers—*e.g.*, Lenoir, Landouzy, Sistach, Gaujot—have held that an important factor in the explanation of the frequency of left-sided varicocele is the contraction of the muscles of the left side of the abdomen, which they say takes place in all right-handed people in movements of the right upper extremity, the left side of the abdominal wall being now fixed to serve as a *point d'appui* to the above extremity. As the muscles of the two sides are intimately blended in the linea alba, I doubt if it be possible for one to remain contracted in this way, and if the above view were correct, I suppose we ought to find right-sided varicoceles in left-handed men.

Symptoms and Diagnosis.—The affection is easily known by the dropping of the scrotum on one side, the projection of the coils of veins through the skin, and by the feel of these dilated vessels, compressible, soft, and worm-like, extending in a mass of varying size from just above the testicle up towards the external ring. The overlying scrotum is often unusually thin, relaxed, moist, and deficient in the power of healthy corrugation: it not unfrequently shows enlarged veins. The erect position, especially when prolonged, causes increase of the swelling, this, together with discomfort, being especially noticed at the close of the day, while they diminish in the recumbent position. It is also liable to be aggravated by sudden exertion, by long walking or riding, especially in summer, or straining at stool. The testicle (p. 525), is almost always thought by the patient to be smaller than its fellow; it is often softer, flabby, and deficient in the firm, elastic plumpness of vigorous health. In large varicoceles, its outline may be concealed by the falling of the vein coils downwards about its upper part. The cord is sometimes hidden by the veins in a large varicocele, but its characteristic feel is usually to be made out after a little trouble, though in some cases it partakes of the flaccidity of the testis, and the proper cord-like feel is much diminished by its flabbiness.

The following subjective symptoms vary extremely in different cases: (1) *Weight and uneasiness.*—These, like the ones next given, are chiefly felt in those varicoceles which appear suddenly or which have increased rapidly. A feeling of dragging weight is felt in the testis, cord, groin, and back; it is explained by the nerves seen in Fig. 73, along which aching of a different kind is experienced sometimes, after operation by ligature of the veins. The discomfort is increased by all those conditions mentioned above as affecting the size of the swelling. (2) *Actual pain.*—This also varies much; when present, it may be a dull weary aching, with occasional exacerbation, radiating, neuralgic, or "crampy." This last form of pain is, Mr. Bennett thinks (*loc. supra cit.*, p. 10), "due to cramp in the cremaster muscle, set up by the irritation produced in its structure by its efforts at sustaining the varying weight of a large varicocele." The same writer thinks that "the acute intermittent and sharp pain felt by some robust subjects during exertion, is partly due to the sudden tension in the veins, causing them to be compressed by the margins of the inguinal canal, but it is more especially caused by the cremaster, which in its contraction forces the full veins against the sharp edges of the external ring." (3) *Tenderness.*—This is the least common of these subjective symptoms. It may be brought about by the friction of prolonged walking or riding, sexual irritation, frequent handling, and, much more rarely, by phlebitis and formation of a thrombus.

Before leaving this matter of aching, pain, and tenderness, I would give one hint to my younger readers, and that is, because these symptoms are often exaggerated, and because they are seen especially in patients who are somewhat feeble both in mind and body, we must not forget that very real aching, pain, &c., do undoubtedly occur in patients who are manly and sensible in every possible way. With this proviso it is undoubtedly the rule that the degree of discomfort is closely proportioned to the amount of attention which the patient pays to his genitals, this being the case even with many of the larger ones, when the patient has faith in his surgeon and in simple common-sense treatment, and, above all, enjoys the blessing of knowing how to neglect his genitals.* (4) The mere *pendulousness* of the scrotum may often coexist with varicocele, and may be a cause occasionally of great annoyance, quite apart from pain, aching, &c. Thus, in February 1893, I saw two instances of this. In one patient, aged twenty-three, sent to me for operation by Dr. Wyndham Powell, the scrotum, hanging thus pendulous, was liable to be nipped in walking, especially in warm weather. In the other patient, a medical man, aged thirty-five, of fine physique, a scrotum pendulous, with a varicocele, led to sudden nipping of the testis and epididymis while the patient was jumping into a dog-cart, and thus to sub-acute inflammation of the globus minor. Neither of these patients had worn what I consider an efficient suspender.

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* The following remarks of Sir B. Brodie apply both to varicocele and irritable testis: "There is no part of the body in which there are not sensations to be discovered, which under ordinary circumstances pass unnoticed. Let any one think of his shoulder, and he will discover in it sensations of which otherwise

In the slight impulse which may exist on coughing, and in its position, a large varicocele may resemble an omental hernia. The feel of the swelling, the slow and incomplete disappearance when the patient lies down, the fact that the finger feels that the ring though free is not dilated, the reappearance of the swelling as soon as the patient reassumes the erect position, although finger-pressure is kept up on the external ring—these points furnish sufficient means of distinction.

Complications.—Those usually described are—(1) neuralgia, (2) arrested development and atrophy of the testicle. Of these I have already spoken at pp. 447, 454. (3) Phlebitis and thrombosis. These complications are infinitely rarer here than in the varicose veins of the lower extremity. Escalier (*Mém. Soc. de Chir.*, 1849-1850, t. ii. p. 86) has recorded two cases in which this complication appeared spontaneously, with suppuration, in large varicoceles. Both patients had lived in hot climates, and both cases ended fatally with symptoms of internal strangulation. MM. Monod and Terrillon add another, recorded by M. Vallin (*Gaz. Hebd.*, 1877, No. 52). The varicocele here was a double one. Mr. Bennett mentions a case of scrotal extravasation from a blow on a varicocele from a cricket-ball, and one of spontaneous rupture while the patient, an old man, was straining at stool. With this last a case, p. 216, should be compared.

Prognosis.—This includes the bearing of a varicocele upon the condition of the patient's mind, the development and nutrition of his testicle, and his ability to play his part in certain paths of

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he would have taken no cognisance; and if he pays constant attention to them they will soon amount to pain, so that a patient who has nothing else to do—a low-spirited, hypochondriacal, unoccupied patient—may persuade himself that he has pains in any one part of his body; ay, and that at last he may suffer as much as if pain really existed."

life. It is thus closely related to the section that follows on Treatment.

With regard to these points Mr. Bennett (*loc. supra cit.* p. 54) states that "two distinct classes of varicocele exist—one in which the veins are merely very large, but not much, if at all, increased in number, and the other in which the increase in number of the veins is in excess of the increase of size. The first of these two classes involves the whole spermatic plexus freely, uniformly, and sometimes is associated with a correspondingly large spermatic vein, the whole vascular arrangement being in point of fact merely abnormally large, but not otherwise unnatural. In such cases, growth out of proportion to that of the individual is rare, either at puberty or at any other time, and there is seldom associated with them any peculiar testicular change or excitability. The second variety, where the increase in the number of the veins exceeds the increase in size, shows itself in the form of an aggregation of veins, some of which may be large, but the majority are of moderate or even of small size, marked especially round the testicle. The affection here involves, for the most part, the lower portion of the pampiniform plexus, the upper portion showing more or less dilatation, &c., but to a very much smaller extent than the lower part. In such cases, growth out of proportion to that of the individual is prone to occur at puberty, and at any time, under certain conditions, up to twenty-five or thirty years of age. Defective development of the testicle, with or without various symptoms of a direct or reflex nature, is common. Although the tumour in this second variety is always smaller and more limited than in the first, I have no doubt whatever that it affords a much greater justification for the rejection of a recruit, in consequence of its proneness to growth, than the large vein type, which, in an ordinary way, shows but little tendency to alteration of any kind." If the two varieties of varicocele given above by Mr. Bennett are found clinically reliable, it will be possible to distinguish between those cases which are likely to grow and those which will probably remain stationary, the chief point upon which the rejection of candidates should turn.

With regard to **the relation of a varicocele to the nutrition of the testicle** I have given my opinion at p. 525. As to the bearing of varicocele in this matter on a patient's mind, and his belief in his virility, two of the most important points in the prognosis, no account would be complete without the following words of Sir J. Paget (*Clin. Lect. and Essays*, p. 274): "There are some to whom, whether through ignorance or misguidance, or hypochondriasis, a varicocele is a source of misery and dismay. They look upon it as a forerunner of impotence, and of wasting testicles, and I know not what besides. All such fears are groundless. Varicocele is troublesome because of the sense of weight and aching which sometimes, though far from always, attends it, and which is sometimes much increased by long standing or walking. In some cases, too, the dilated veins, like varicose veins in the leg, are apt to become inflamed or very sensitive. But this, I believe, is the widest limit of the harm that varicocele ever does. I do not believe that it ever produced wasting of a testicle, or impotence, or any such thing. It is common enough to find varicocele in quite healthy men, who being sufficiently careless or sensible to make light of it, suffer no harm either mentally or bodily. Some who have it while they are single and chaste are cured by marriage; and in some it ceases to cause even its slight occasional aching when they grow old. In short, the cases where varicocele is more than a trivial affair are very few; and in these few its mischiefs are not such as the sexual hypochondriacs imagine. They are, indeed, altogether distinct from the functions of the sexual organs; being such achings and wearying pains as may be felt in varicose veins of the leg. These may be sufficient to disqualify a man from military service, but they are not sexually important; and in those that believe that they are, it is a mental error, not a bodily one, that needs cure." While all will agree that in the great majority of varicoceles which come for treatment, it is the mental element which requires most attention, it will be gathered from my remarks at p. 526 that, in my opinion, cases do, very occasionally, occur in which marked atrophy has taken place. This condition, which is sometimes permanent, is especially to be feared in varicoceles which are made up of a great number of small veins, especially when these hang down about and over the testicle (Fig. 73). More often the condition which the patient takes for atrophy is really only a soft, flabby condition which temporarily replaces the elastic plumpness of health, and which is due to the altered circulation and nutrition (p. 526).

In the very great majority of cases the patient may be assured out of the nineteen cases in which I have operated, five were private cases, of which four were passed into the army and navy, and one was a medical man, operated upon for double varicocele: of fourteen hospital cases, one was desirous of entering the police, and subsequently did so; one was a goods-guard on probation and found that a large left-sided varicocele threatened to spoil his prospects, the aching pain, which invariably followed the jumping in and out of his van, being only relieved by the patient's lying down, and being inevitably brought on again by the next station. This man stopped me on London Bridge some five years after, to say that he was in regular employment as a goods-guard, married, and the father of two children. Five others were shop assistants, and two were gardeners. (2) In any case where the varicocele persists or steadily increases, in spite of treatment, and where it is accompanied with much distress, annoyance, or pain, or where it interferes with some justifiable pursuit, such as riding; (3) where the surgeon has satisfied himself that the testicle is undergoing atrophy; (4) where the varicocele is accompanied by frequent seminal emissions and much mental misery. In the two last given indications great caution must be shown before operation is resorted to, and the last is the most doubtful of all. Where the patient is clearly hypochondriac, or one of those monomaniacs in genital matters, to which I have referred at p. 468, no operation is, of course, to be thought of. It is certain to be a failure.

The choice of operation is a very large one, but as I consider that one alone has been proved to be alike efficient and simple, I shall not occupy my space with an account of any others, or with the history of the operation. Like so much else in operative surgery, the only efficient and simple operation for varicocele dates to the great discovery of Sir J. Lister.

Antiseptic Excision.—This operation, performed with the parts well in sight, has the very great advantage of allowing the surgeon to carry out each step with precision, to include what he thinks safe, and no more; it does away with the risk of transfixing a vein, and its possibly disastrous results of septic thrombosis; it requires very few and simple instruments; while Sir J. Lister's teaching has enabled us to perform it without the risks of hæmorrhage, cellulitis, and blood-poisoning, which were so terribly frequent in operations on veins performed before his day.

For a few days before, the bowels should be kept well open, and the diet should be light and limited. The parts should be shaved, and thoroughly cleansed with soap and water, and then lotio hyd. perchlor. (1–1000). It is well to perform the cleansing a few hours before, and to keep a compress wet with the above lotion on up to the time of the operation. The patient being anæsthetised with ether or A.C.E. mixture, the vas deferens is isolated, and handed over to an assistant, who stands on the opposite side to the surgeon. The latter then makes the veins prominent by grasping the affected side of the scrotum and protruding the varicocele. An incision, about one inch and a half long, is then made over the now prominent varicocele, care being taken to keep well above the level of the tunica vaginalis.* With one or two strokes of a keen-edged scalpel the packet is exposed and carefully opened. The surgeon then passes a steel director, first at the upper and then at the lower angle of the wound through the packet, so as to leave about a third of the veins behind it; along the director, which thus keeps a track open and easily found, an aneurism-needle or eyed-probe, carrying a medium-sized ligature of chromic gut, is passed. This is then tied firmly round the included veins. If the incision has been made one inch and a half long, and the upper and lower angles of the wound are well retracted, no difficulty will be experienced in placing these ligatures near enough to the external abdominal ring and testicle respectively to ensure removal of a sufficient extent of the enlarged veins. After each ligature, upper and lower, has been tied securely and cut short, a pair of scissors is run along the director, and the packet is cut through about a quarter of an inch from each ligature. The portion of varicocele thus included is then removed by carefully clipping it out with a pair of scissors; any cross branches which may now be divided are secured with fine chromic gut. An extremely important step comes next. With a sharp-pointed half-curved needle, carrying medium chromic gut, the surgeon brings into accurate opposition the two ends of the stumps, the ligature being passed through the centre of each stump close to the corresponding ligature. As it is tightened, an assistant, with a sharp-pointed probe, brings the cut ends of the veins on the face of each stump snugly and precisely together. The object of this most important detail is to permanently shorten the cord, and to restore the natural suspension of the testicle. It would obviously be quite impossible in any subcutaneous method. I have practised this detail since 1887, and pointed out its importance in my *Operations of Surgery*, 2nd ed., 1891, p. 988, but as Mr. Bennett was the first to draw attention to this step (*Lancet*, Feb. 1891), the credit of showing the importance of it must be his. A little iodoform being then dusted in, the sutured cord is replaced in the bottom of the wound. When the skin is much relaxed, I finish the operation by removing widely, by two elliptical incisions, the skin on either side of the small wound which has been made, the apex of the incisions being placed well up over the external ring. I think it well to adopt this step, as I believe it helps to brace up the relaxed parts; but it is not of the least use by itself, and it is much less needed now if the above-given precaution of ligaturing together the vein-stumps, and thus shortening the cord, is taken. And the same may be said of another step which should be taken before the close of the operation—*i.e.*, ligature and removal of any very enlarged scrotal veins, a step which I always adopt when the patient's attention has dwelt on these. The whole wound, superficial and deep, is then carefully scrutinised, and, every bleeding point being secured, is thoroughly dried with a sponge that has been well wrung out. A horsehair drain being inserted, the edges of the wound are carefully adjusted with silk sutures, the tendency to inversion being met by a second set of horsehair. Dressings of iodoform or sal alembroth gauze are then applied, due facilities being provided for the patient's micturition. In securing the dressings *in situ*, care should be taken to keep the scrotum well up on to the pubes by bringing the turns of the spica from below upwards, and not in the reverse direction. I generally change the dressings at the end of the second or third day and remove the horsehair drain, and again at the end of the first week to remove alternate sutures. At this date the patients may get on to a sofa, but I insist on their maintaining the recumbent position for three weeks. Antiseptic union, forming quickly and without the medium of granulations, remains weak for a long time. If the stumps of the cord have been sutured together, there is much less need for the patient to wear a suspender afterwards; but to give the operation every chance, and to save all drag and tax upon parts which have very recently united, I generally advise that a suspender be worn for three months. In addition to the support which I believe to be advisable while the sutured stumps of the cord are being firmly knit together, I am of opinion that the continuance of support to the parts for a while prevents a too rapid melting away of the little nodular mass, which, callus-like, marks the seat of the operation.

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* In some cases, where numerous veins overhang the testicle itself, the lower ligature should be placed as low as possible. If, in the earlier incisions, the tunica vaginalis is opened, the opening should be taken up with Spencer Wells's forceps and sutured with fine catgut, or it may be left open and a horsehair drain inserted by a counter-puncture. If the wound runs an aseptic course, this complication will give very little trouble.

The points to which I should attach most importance in the operation are maintenance of strict asepsis throughout by irrigation with lotio hyd. perchlor. (1–3000), suturing togetherthe two stumps, and so shortening the cord and providing for suspension of the testicle. Arrest of all hæmorrhage, thorough drying out of the wound, the use of a horsehair drain, especially if the parts have been much disturbed, and the careful application of an antiseptic dressing, so as to keep the scrotum well up on to the pubes. I look upon these details as most necessary, if rapid healing is to be made certain of, and cellulitis, epididymo-orchitis, and hydrocele prevented.

Mr. Bennett (*loc. supra cit.*), in his operation for varicocele, advocates some different and, in two instances, far more radical steps ; thus (*a*), he does not open the general sheath immediately surrounding the veins, as by leaving it intact he makes certain of passing the ligature around *all* the affected veins, as none of these ever lie outside the fascia. Again, the fascia, if not opened, better carries the weight * of the dependent testicle. (β) Mr. Bennett considers that the view generally held, that the spermatic artery is displaced with the vas deferens and thus kept out of the way, is a mistake ; in reality, the artery remains with the veins. Furthermore, Mr. Bennett holds that the artery is usually, and may always be safely, divided with the veins, for as long as the wound remains aseptic, the artery to the vas deferens, "and some outlying branches of the spermatic artery, one of which sometimes comes off high up and so may easily escape division, are sufficient to carry on the blood supply to the testicle, and to prevent any risk of atrophy."

While Mr. Bennett's plan is justified by the results obtained by his own practised hands, I feel that, writing as I am for those who may not have had many opportunities of operating for varicocele, I ought to point out certain grave risks which I consider to be at least possible, if the above teaching is widely followed.

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* This is rendered of less importance by the suture which unites the vein stumps.

First, as to division of *all* the veins, I will say at once that perhaps I am prejudiced unduly by the unfortunate result of one case, out of my nineteen, which I mention below. While I admit that recurrence of the varicocele may be brought about by removal of too few of the veins, I feel strongly that inclusion of all of them in the ligature involves a much graver risk. Further, I cannot agree with Mr. Bennett that it is safe to trust to the artery of the vas, or branches of the spermatic which may come off sufficiently high up to be available, and some small unimportant anastomotic branches passing from the sub-vaginal tissue. Mr. Bennett allows that these vessels are small and delicate, and points out that any inflammation about the parts may be sufficient to choke them, sloughing or wasting of the organ following as a necessary result.

Thus, while in no way criticising Mr. Bennett's modifications of the operation when practised by himself, I strongly advise my junior readers to make use of the simpler and very efficient method given at p. 539.

The **chief risks** and **causes of failure in the operation** are as follows :—

I. **Sepsis and its results.**—The risk of these was always present with the old subcutaneous operations, however modified; it is by no means to be lost sight of with the open operation performed with the advantages of modern surgery. A good instance of sepsis and its dangers is recorded by Mr. H. Lee (*Clin. Soc. Trans.*, vol. i. p. 73). Here erysipelas, repeated hæmorrhages, sloughing of the skin of the scrotum and penis, and multiple abscesses, followed on Mr. Lee's operation of subcutaneous division of the veins between two pins secured with figure-of-eight sutures. Mr. Lee also mentioned cases in which abscesses, localised sloughing of the skin, and, on two or three occasions, arterial hæmorrhage, controlled by introducing a third pin, have happened in his experienced hands. It is certain that other operators have not been so candid.

II. **Inclusion of too many veins.**—That this is a real danger is shown by a case of mine which I published (*Syst. of Surg.*, vol. iii. p. 571). The patient here had a double varicocele, that on the left side being truly colossal. It was my third case, and was operated on with precisely the same precautions as to the vas and to the maintenance of asepsis as those given above (p. 539), save that the carbolic spray was used instead of irrigation. Owing to the huge size of the varicocele, three bundles of veins were removed, and even then a large number appeared to be left, the varicocele being a quarter of its former size. The case did well up to the eighth day, when the wound opened, and the lower half of the testis, evidently gangrenous, presented itself. This was cut away after the application of a chromic gut ligature. Though, at the close of the operation, it did not appear that too many veins had been removed, such must have been the case. I am certain no injury was inflicted upon the vas deferens; throughout the operation this was entrusted to very careful hands, those of Dr. B. N. Rake, at that time my dresser, now of Trinidad, and well known as an authority on leprosy.

III. **Recurrence of the Varicocele.**—I am of opinion that if operation-cases were more thoroughly followed up afterwards, this sequela would be found to be more common than is thought to be the case. It is especially likely to follow the subcutaneous method, where the patient is allowed to get up, or is hurried out of the hospital to make room for another case as soon as the wound is healed. To prevent this risk of recurrence Mr. Bennett lays stress on the need of removing the entire plexus of spermatic veins. As I have been unfortunate enough to meet with a case in which, in spite of care taken, too many veins were ligatured and removed, I cannot agree with Mr. Bennett (p. 541). Another instance of what appears to be recurrence, but which is really an escape of the lower part of the spermatic plexus, may be due to the upper ligature being applied too low down (Bennett). In this case the part of the plexus between the upper ligature and the external ring remains full, and may give trouble for a time, though it gradually shrinks.

Insecure knotting of the ligature, or not using reliable material* may, of course, lead to recurrence after any method in which ligatures are used, but the veins are not also divided.

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* Mr. Bennett prefers kangaroo-tail tendon ligatures.

PART III.

DISEASES OF THE SCROTUM.

CHAPTER I.

INFLAMMATORY AFFECTIONS OF THE SCROTUM.

SECTION I.

CHRONIC ŒDEMA OF THE SCROTUM.

THE skin of the scrotum being rugose and distensible, the subcutaneous connective tissue being abundant, loose, large-meshed and devoid of fat, and the scrotum being often dependent, serous infiltration can take place to an enormous degree. This is common enough in a chronic form as part of a general anasarca from cardiac failure or renal disease. Here there is a general alteration of the circulation; and a somewhat similar affection is met with as a local affection in old men, and, at the other extreme of life, in young infants. In all these cases it affects both sides; as a unilateral affection, it may sometimes follow a one-sided interference with the venous circulation, but the most common instance of unilateral œdema of the scrotum is seen when an infantile hydrocele is treated by acupuncture (p. 170).

Diagnosis.—The characters of œdema of the scrotum in a chronic form are so well known from the appearance of the parts in dropsy, that the recognition of this condition is easy. Mr. Curling quotes from Pott (*Chirurg. Works*, vol. ii. p. 336) the following case, which shows how difficult it may occasionally be to distinguish between a localised œdema and hydrocele, Pott himself having made a mistake between the two. A man, aged forty-five, had a swelling on the left side of the scrotum, which was large, full, tight, and had many symptoms of hydrocele—viz., fluctuation, freedom of the upper part of the process, and concealment of the testicle. Thinking himself clear as to the true nature of the disease, Pott without scruple introduced a small trocar at the lower and anterior part, and let out about 2 oz. of limpid water, but could not draw off any more. He then withdrew the cannula and examined the swelling again, which was but little diminished though altered in appearance. The testicle could then be plainly distinguished, and Pott was convinced that the disease was (what he had never seen before), an anasarca of the scrotum on one side only, having a certain quantity of water in one cyst or bag, and the rest diffused through the cells in the usual manner: the latter made all the swelling which remained after tapping, and the former had concealed the testicle.

As Mr. Curling adds, "If this case had been narrated by a surgeon of less judgment and experience than Pott, we should be inclined to suspect that the swelling had originally been a hydrocele, and that, when tapped, the fluid had partially escaped into and infiltrated the connective tissue around the sac." The cause of the effusion, which must have been unilateral, is unexplained.

Treatment.—Œdema of the scrotum, when of the chronic kind and without inflammation, is usually a sign of other mischief the cause of which should be treated. But when the swelling is so great and the skin so tense as to threaten to mortify, relief must be given by acupuncture. The greatest care must be taken to use a clean needle, previously dipped in boiling water and in carbolic-acid lotion, and to keep the parts aseptic afterwards, for an erysipelatous erythema, followed, perhaps, by severe inflammation and sloughing, is not uncommonly seen after punctures made to relieve dropsy. For this reason some may prefer to try, first, the effects of Southey's tubes.

SECTION II.

INFLAMMATORY ŒDEMA. DIFFUSE INFLAMMATION. CELLULITIS. ERYSIPELAS. GANGRENE OF THE SCROTUM.

All these conditions are so closely allied that they may be considered together. The anatomical conditions met with in the scrotum (p. 544), which predispose to œdema, render this region very liable to diffuse inflammation, cellulitis, &c.; and what is more important, though we look upon the scrotum as being a part of the genitals, well supplied with blood, its tissues have no great degree of vitality, the arterial branches to it are long and delicate and they run in loose cellular tissue, which, while it gives them but little support, is readily loaded with inflammatory products, and thus, from the strangling of its vessels, soon passes on into sloughing. Finally, the abundance of the lymphatics accounts for the rapidity with which septic infection may spread.

The following points must always be borne in mind with regard to the above affections. In some cases there is no apparent cause for the attack. The prognosis is very grave when the patients are at either extreme of life, when they are run down in health, intemperate, ill-fed, or the subjects of visceral disease. Erysipelas of the scrotum may easily spread—erysipelas errans—in little children, in whom the funicular process of peritonæum may be open; this fact may bring great danger. Lastly, cellulitis, sloughing, &c., of the scrotum may closely resemble extravasation of urine.

Causes.—Perhaps the commonest instance of scrotal cellulitis and œdema is that seen in acute and sub-acute epididymo-orchitis. Erythema, mild degrees of cellulitis, and erysipelas may be set up by very trifling causes, such as intertrigo, eczema and other eruptions, abrasions, boils, contusions, ecchymoses, and fistulæ about the perinæum and anus.* Other causes are, very acute gonorrhœa, causing phimosis, or reaching the scrotum from the urethra, puncture of a hydrocele (p. 137), injection of an irritant (*e.g.* iodine) into the scrotal subcutaneous tissue, cellulitis extending to the scrotum from the rectum, and due to the perforation of the bowel by a fish-bone. While extravasation of urine shows cellulitis, sloughing, and gangrene of a typical kind, it cannot be too strongly insisted upon that these conditions may be extremely well marked and yet no escape whatever of urine into the cellular tissue have taken place. Gangrene usually follows on some inflammatory condition; sometimes it sets in very rapidly, the integuments becoming greenish-black, without the preliminary stages of erysipelas, cellulitis, &c. Such cases occur occasionally in the course of fevers, as was the case in the typhus of former days, but that they are not unknown in certain countries* at the present time in typhoid, with its occasional long continuance, is shown by Dr. Keen, of Philadelphia (*Toner Lecture*, 1877: "The Surgical Complications and Sequels of Fevers," p. 38). According to this writer, this form of spontaneous gangrene of the genitals resembles that which attacks the nose, ears, and feet—*i.e.*, parts supplied not by one large vascular trunk, but by many smaller branches, being parts entirely distant from the centre, and those which lose their heat readily by reason of their thinness and small size; and parts irritated, it may be, by local discharges. Other less common instances of gangrene of the scrotum, after infectious diseases, may be seen in small-pox, scarlet fever, and, according to v. Pitha, after mumps. Acute infection, thrombosis, cardiac failure have here to be all remembered as factors in the gangrene. Gangrene of the genitals (but especially as noma in little girls) has been occasionally noticed in children during their recovery from one of the exanthemata.† Where sloughing, cellulitis, and gangrene of the scrotum seems to be idiopathic in origin, the habit of hard drinking, bad living, want, debauchery, the existence of degenerated viscera, especially the kidneys, or the presence of diabetes, must always be thought of. In another class of cases gangrene may follow without any cardiac failure, degeneration of viscera, or plugging of vessels, and it may be added, perhaps, without any septic changes having first occurred in the scrotum, but merely from extreme distension of the scrotum. Of this, a case published by Reuss, (*Journ. de Thérap.*, March 25, 1880) seems to be an instance. The patient, a weakly man of forty-four, but not of tubercular history, suffered from double epididymitis with great pain and distension of the scrotum. Two days later, a black spot appeared at the lower part of the right half of the scrotum. This spread, destroying all that side of the scrotum and exposing the testicle; healing ultimately followed.

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* Kocher quotes Englisch as his authority for the statement that in peritonitis, in inflammations of the ejaculatory ducts or the seminal vesicles, and in pericystitis inflammatory œdema may appear on the scrotum. According to Kocher the reverse may take place, and inflammation of the scrotum may extend along the cord to the vesiculæ and prostate, producing deep-seated suppuration only to be detected and opened per rectum.

Lallemant has described, under the term "Gangrène foudroyante," cases in which in young and strong men, without any distinct cause, a few hours after swelling of the scrotum had appeared, with violent pain and pyrexia, a macular gangrene of the penis and scrotum followed.

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* Especially on the Continent. Gangrene of the genitals during fever seems almost unknown amongst English-speaking nations.

† Kocher quotes two cases from Paley in which gangrene of the scrotum was transmitted from puerperal fever in women, and one of Menzelova's, where acute gangrene of scrotum and penis followed on a soft chancre.

Symptoms.—The early swelling of the scrotum increases rapidly, the part, in an adult, soon attaining to the size of an infant's head, or a cocoanut. The skin is now smooth, tense, glossy, and an erysipelatous tinge may quickly extend on to the penis, or neighbourhood of the groins. Any redness soon becomes dusky, or, in patches, dark purple. A few hours later these are greenish black. Great local heat is now replaced by cold, pain, and by loss of sensation. An erysipelatous blush with œdema is often present on the pubes and groins and may extend for a considerable distance. If there is any swelling in the perinæum it is not localised to the neighbourhood of the raphé, and a soft black or double silk-web catheter usually passes easily into the bladder. In spite of incisions which give vent to a free discharge of blood and serum, sloughing of the scrotum takes place, the anterior aspect almost entirely disappearing and the testes being exposed. Extreme fœtor is present, and diarrhœa, pleurisy, or broncho-pneumonia may further complicate the case. Secondary hæmorrhage may take place during the detachment of the sloughs. Even when the sloughing has stopped and healing has begun, attacks of erysipelas may recur, or fœtid abscesses form in the abdominal wall or groins.

The **prognosis** is extremely gloomy from the marked tendency to asthenia, the grave complications above mentioned, and the deterioration of important viscera often present. High fever of a septic character accompanied by a feeble quick pulse and dry brown tongue, may quickly pass into coma or delirium and end fatally in a very few days.

Treatment.—In a mild case of erythema or erysipelas iced boracic lotion or an ice-bag over boracic-acid lint may be tried, in a patient whose circulation is good and the general powers unimpaired. Where the circulation is poor, hot boracic acid or hot lead and opium lotion will be better applications. Where the swelling and redness are marked, incisions should be made early to relieve tension, and repeated, if needful, bleeding being arrested by numerous Spencer Wells's forceps and ligatures, while every care is taken to maintain the general health by strong beef tea, eggs, brandy, good stout or ale, champagne, bark or quinine.

As far as possible the wounds must be kept sweet by the use of strong solutions of mercury perchloride, at first 1 in 1000, hot boracic-acid lotion frequently renewed, iodoform, sanitas, boroglyceride, or a lotion of tincture of iodine mixed with a solution of carbolic acid (1 in 80). When the sloughs have separated, skin-grafting may be resorted to, the flaps drawn together by strapping, and some stimulating application as compound tincture of benzoin, or diluted turpentine employed. If secondary hæmorrhage give trouble, several pairs of Spencer Wells's forceps should be left *in situ* for thirty-six hours.

SCROTAL OR EXTRA-VAGINAL HÆMATOCELE.

The origin of the ordinary vaginal hæmatocele has been much discussed (pp. 215–221), but there is no doubt that the variety now under consideration always dates to an injury, or to tapping. While extra-vaginal hæmatoceles often coexist with the vaginal form, it is to the variety in which the blood is effused only into the cellular tissue of the scrotum that the following remarks apply. In the best-marked case of scrotal hæmatocele which has come under my notice, the hæmorrhage was brought about by the strenuous efforts of a patient of about fifty to reduce a large scrotal hernia, which, after existing several years, had become strangulated. The meshes of the scrotal cellular tissue, in addition to those of the cord itself, were loaded with dark partly coagulated blood from a point above the external ring down to the fundus scroti. The case did well, but ran a very tedious course, owing to the entire absence of primary union in the damaged tissues.

In the following cases the extra-vaginal hæmatocele was of some standing. The Hunterian Museum specimen, No. 4299, shows a hæmatocele in the cellular tissue of the left half of the scrotum. Two large cystic spaces, extending upwards around the spermatic cord, occupy the front and back part of the preparation ; they are distinct, except at their upper part, where they communicate by a small opening, and their walls are covered with coloured clot. The testicle, exposed by an incision, lies below the cystic spaces ; its substance is healthy ; the cavity of the tunica vaginalis is obliterated by adhesions, except above the testicle, where a small cavity exists, but this did not communicate with the other spaces, and did not contain clot. By dissection, it was distinctly ascertained that the walls of the cysts were formed by the layers of connective tissue of the scrotum. The man was fifty-seven years of age, and a patient of Mr. Rivington. Sixteen years before the operation the left side of the scrotum became swollen after a kick from a horse ; under treatment the swelling subsided. Three years later he again injured his scrotum, and after this it gradually enlarged. Two months before he came under observation a third blow was received on the part. The scrotum was greatly enlarged, opaque, and fluctuating; it was tapped, and 60 oz. of fluid resembling chocolate were removed, the swelling afterwards remaining half the original size. Complete removal of the mass, together with the testicle, was then performed. Specimen 4300 in the same museum shows another extra-vaginal hæmatocele, the cavity in the wall of the scrotum here containing fibrin, liquid blood, and pus. The walls of the cavity were thick and fibrous, and separated from the extravasated blood by a shaggy surface.

The following interesting case, published by Mr. M'Carthy (*Lancet*, 1890, vol. i. p. 597), shows well the difficulties of diagnosis which may be present in these cases, and the correct treatment—viz., an aseptic incision.

A man, aged seventy-four, was admitted into the London Hospital with a large swelling in the left half of the scrotum. The swelling was globular below, but above had a tubular prolongation which filled the inguinal canal, and terminated at the internal ring. The skin at the bottom of the scrotum was discoloured, as if from slight subcutaneous hæmorrhage. The swelling fluctuated distinctly, but was not translucent. The patient stated that he had been repeatedly tapped, and that clear yellow fluid had been drawn off. There seemed, therefore, no reason whatever to doubt that it was a hydrocele of the tunica vaginalis, with thick walls, or opaque contents, possibly from the presence of chlolesterine. When the swelling was tapped, about 10 oz. of dark bloody fluid were drawn off. There was still some enlargement of the scrotum remaining, but this was attributed to blood clot, and possibly thickened sac. The patient could not remember any injury. The last tapping had been in August 1889, and the swelling had formed gradually. The patient had no cough, nor was he subject to any violent exertion. During the ensuing ten days the sac refilled, and was again tapped; a smaller amount of fluid similar to the first was drawn off; strapping was applied, and as there was no return of the fluid, the patient was discharged, with directions to come back, if he had any further trouble. He returned at the end of a month with the sac again full. As his general condition was excellent, Mr. M'Carthy, when the patient had been anæsthetised, incised the swelling freely. Dark-coloured fluid escaped, but the walls of the sac were quite smooth and free from clot: on removing some œdematous decolorised fibrine, the testicle became visible, with its tunica vaginalis intact, and distended with what proved to be about 2 oz. of ordinary hydrocele fluid. The testicle, suspended by the cord, lay quite free in the adventitious sac, which in colour, thickness, and consistence resembled parchment. The parietal layer of the tunica vaginalis was incised, and the adventitious sac peeled off with considerable difficulty from the scrotal tissues. There was no capillary bleeding; two small veins required ligature. A fortnight after the operation the patient was discharged with the wound healed.

Mr. M'Carthy remarked that this case was unusual: (1) in the gradual formation, and the undiscoverable cause of the primary hæmorrhage. This may have arisen from injury to a vessel during a tapping, and it is possible that the age of the patient, with the loose scrotal tissue and diminished contractile power of the dartos, may have predisposed to the formation of the cyst; (2) save for the very slight discoloration of the skin at the lowest part of the scrotum, all the ordinary indications of a scrotal hæmatoma were absent.

CHAPTER II.

NEW GROWTHS OF THE SCROTUM.

THESE are rare. The most important are Epithelioma and Elephantiasis, but very few instances of either are seen in this country.

SECTION I.

MALIGNANT DISEASE OF THE SCROTUM.

This is almost invariably epithelioma. As might be expected, melanotic sarcoma may occasionally arise in any mole of this pigmented region, and this disease will be referred to below (p. 562). Mr. Harvey Ludlow describes, in his Jacksonian Prize Essay, the case of a shoemaker, aged fifty-three, who was under Mr. Stanley's care, in St. Bartholomew's Hospital, for a large open, cancerous ulcer in the scrotum. The growth was removed, together with the right testis and some inguinal glands. Sir J. Paget found no evidence of epithelioma microscopically, but cells similar to those of scirrhus.* Another way in which malignant disease of the scrotum may be met with is when recurrence takes place in the scar of castration.†

Epithelioma of the Scrotum.—This is usually known as "chimney-sweep's cancer."‡ Several points of interest—viz., the question of its decrease and the explanation of this, the relation of this disease to the occupation of chimney-sweeping, and its comparative frequency in England, while in other countries where soot is also abundant, the disease is hardly known—these points and others will be referred to later, after a short sketch of the disease has been given. In its origin, structure, course and implication of adjacent glands, more distant regions usually escaping, epithelioma of the scrotum corresponds with epithelial cancer of the skin elsewhere. In this region it often shows two distinct stages, first that of papilloma and later that of epithelioma (Fig. 75) Thus it commonly begins in a small soft wart or pimple on the scrotum, most often on the lower and fore part. The wart that starts all the subsequent mischief appears to be of a simple nature, and may remain for a long time without change, increasing very slowly. Sooner or later it enters on a very different stage, it becomes vascular, softer, and grows quickly. Excoriation soon follows with a foul, thin discharge which encrusting forms a scab. If the scab be removed, an ulcer, with many of the features characteristic of epithelioma, is found beneath. Thus it shows a surface of uneven depth covered at one spot with slough, at another with a scab, at a third with large prominent granulations which never heal or advance, but break down and slough, or cover themselves with a co-existing scab. The base on which this ulcer rests is markedly indurated, and its surrounding edges hard and everted, and sometimes sinuous and tuberous.

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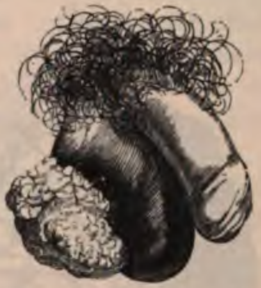
* A very rare case of "medullary cancer" of the scrotum, requiring the removal of both testes, was recorded by Mr. Craven of Hull (*Med. Times and Gaz.*, vol. xix. p. 287). This perhaps originated in one tunica vaginalis.

† Dr. Moxon (*Path. Soc. Trans.*, vol. xx. p. 330) has recorded a case in which sarcomatous, adenoid, and cartilaginous tissues recurred in the cicatrix of the above operation.

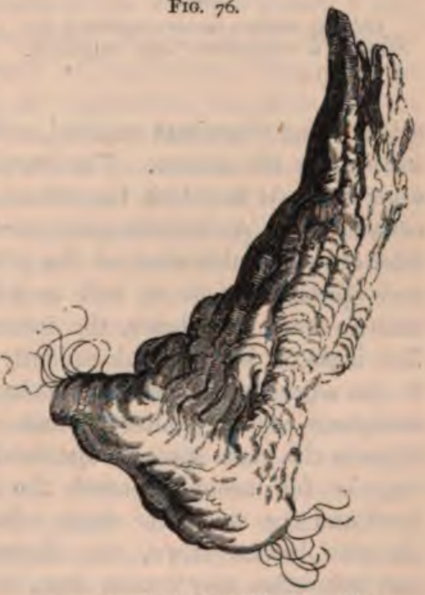
‡ On the frequency of this in chimney-sweeps, see pp. 558, 559.

FIG 75.



1, Small soot warts, papilloma scroti. 2, Epitheliomatous ulcer, a later stage of the first. (Curling.)

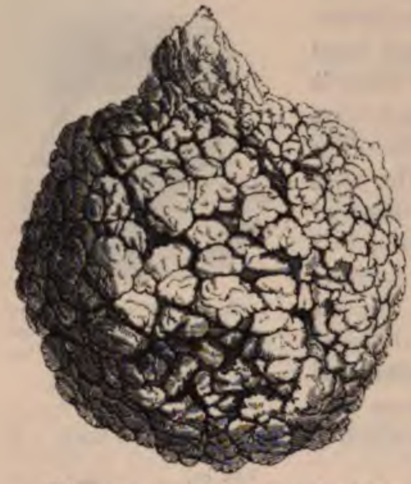
FIG. 76.



Soot cancer beginning with a horn-like papilloma. (Wadd.)

Other forms in which this disease may originate are horn-like excrescenses (Fig. 76), merely modified warts or papillomata, and like them, quite superficial at first. Another and very important initial form of epithelioma of the scrotum is that of a small subcutaneous nodule, over which the skin may be thin and adherent, but otherwise not affected. Here the mischief has probably commenced in a sebaceous gland or hair-follicle. The importance of this initial form is very great, as, owing to its being beneath the surface, it is liable to be overlooked until the pre-cancerous stage has passed by. In another variety the papilloma and epithelioma take the form of a cauliflower outgrowth (Fig. 77). In whatever way the disease begins, ulceration of the malignant nature described above is sooner or later certain. This goes on spreading until the scrotum is destroyed ; the crura of the penis, thickened tunica vaginalis, or the testicles themselves being sometimes exposed, and even the perinæum or groins invaded by the disease. The inguinal glands are enlarged soon after the wart in which the cancer originates enters on its more active stage. At first the enlargement is merely inflammatory, but later on, when ulceration of the primary growth has taken place, and epitheliomatous as well as inflammatory products have had time to reach the glands, the induration is here malignant also. This is shown by their subsequently softening, becoming adherent to the adjacent structures, breaking down, and forming excavated malignant ulcers, similar to that on the scrotum. While the ulcer in the groin spreads superficially and deeply, nodular masses may be felt around beneath the skin ; these, later on, become fixed and the skin over them adherent and somewhat brawny. As this breaks down, the ulceration extends. The swelling and induration may extend along Poupart's ligament as far as the anterior superior spine in one direction and the pubes in the other ; in a downward direction, the cruro-scrotal fold may be invaded. Large quantities of the infiltrated tissues gradually slough away, leaving a deep, irregular, cavernous ulcer in Scarpa's triangle, with

FIG. 77.



Chimney-sweep's cancer occurring in the form of a "cauliflower"-like outgrowth. (Curling.)

thin, sanious, foul discharge. Much pain of a gnawing character is experienced in the groin and down the limb. This becomes œdematous, the appetite fails, and the patient sinks, worn out by the pain and discharge, aided in some cases by a low form of erysipelas and septic œdema. Occasionally, after one or two slight hæmorrhages, profuse bleeding takes place suddenly, from an ulcerated opening into the common femoral or the external iliac, and the patient's sufferings are thus mercifully shortened.

At the necropsy the disease is commonly found to be limited to the scrotum and penis, and not to have invaded the lumbar glands,* abdominal viscera, or the lungs.

This most important fact that epithelioma long remains localised, especially when, as on the scrotum, it usually begins as a papilloma, and that even at the last it does not commonly extend beyond the nearer groups of glands, should make us earnest in recommending operative treatment at the earliest possible moment.

While speaking of *the extension to the inguinal glands*, I may refer to one or two points of interest; one is that the secondary affection of the groin glands may be long delayed, being deferred for several years, and making its appearance long after removal and without any recurrence of the primary disease. The following case, recorded by Mr. Butlin ("Three Lectures on Cancer of the Scrotum in Chimney-sweeps and others," *Brit. Med. Journ.*, 1892, p. 1343), is a good instance. C. C., aged forty-eight, a chimney-sweep, was admitted into St. Bartholomew's Hospital in 1878. When he was twenty-eight, a soot wart had been removed from his scrotum. When he was about thirty-five, a second wart had been successfully removed. In 1873, when the patient was about forty-four, Mr. Baker removed an epithelioma, the size of a walnut, from the left scrotum. The disease penetrated so deeply, that a portion of the tunica vaginalis was of necessity removed, and the testes exposed. It is stated that there was no enlargement of the lymphatic glands at that time. When readmitted, January 1878, the patient was suffering from a large mass of adherent glands in the left groin, from which offensive liquid discharged through several openings. He had only noticed the enlargement of the glands two months before. The scrotum and the adjacent parts were examined with the greatest care, but the closest scrutiny failed to detect any wart or ulcer, or any unnatural indication of the healthy scars. The following are possible explanations of cases like the above, where the enlargement of the glands is deferred for several years, and where there is no recurrence of the primary disease during this time. It is possible that though no enlargement of the glands could be detected at the time of the operation they were affected, but that the progress of the cancerous mischief in them has been extremely slow. A more likely explanation of the long-delayed implication of the groin glands is, I think, given by the probability that in them, as elsewhere, a "pre-cancerous" condition has preceded the stage of epithelioma. We shall see below that, in addition to the primary wart or cancer, the skin of chimney-sweeps is often extensively affected by the constant irritation of soot. Thus, in Sir J. Paget's words (*vide infra*), "In many of them, even when they are thoroughly cleaned, the whole skin is dry, harsh, and dusky; and before operation for the removal of scrotal cancers in them, it is a common question whether one or more warts or scaly patches near the chief disease should be removed with it." From a scrotal skin like this, in a state of irritation, it may be for a lifetime, the groin glands must receive products of irritation, which may remain quiet for years in a "pre-cancerous" condition, and later on break out in actual cancer. This view has recently received support by facts which Mr. Spencer has brought forward with regard to the presence and distribution of soot in the skin, in cases of chimney-sweep's cancer (*Med. Chir. Soc. Trans.*, vol. lxxiv. p. 59). Thus, his microscopical specimens proved, that not only in the sections of the growth itself was soot to be found, alike in cells in the centre of the ulcer, in epithelial cell-nests, and in the descending epithelial processes; in the growing margin of the growth; and the surrounding area of inflammatory small cells; but that in still healthy skin, beyond the margin of the growth, the cells of the rete Malpighii were filled with black granules. The following conclusions of Mr. Spencer are full of practical interest to the surgeon:—(1) Large cells having taken up soot which has entered the skin are to be found outside the growth, and may travel to the neighbouring lymphatic glands, just in the same way as is the case with cells filled with innocuous carbon in the respiratory tract, and there set up in the lymphatic glands "chimney-sweep's cancer." We should then have an explanation afforded of the way in which soot-cancer may develop primarily in the lymphatic glands. (2) The presence of soot in the lower cells of the epidermis, or in the tissues outside the growth, explains the dusky patches in the skin of sweeps which no amount of soap and water will remove. (3) The presence of the soot in the skin and tissues suggests that it may remain latent there until "predisposition" favours the starting of cancer. If that be so, we have an explanation of the fact, which has until now proved puzzling — viz., the development of "chimney-sweep's cancer" years after the patient has ceased to come in contact with soot. (4) The presence of soot in the skin further explains why recurrence may take place, not in the scar, but at some distance from it. This has often happened on the scrotum. (5) Cells filled with the soot are seen among the leucocytes outside the margin of the growths. These black cells are epithelial in origin, and therefore form the advancing portion of the disease. It has been for long an axiom in clinical surgery that a wide margin must be removed beyond the apparent margin of the growths. But it is impossible, as a rule, to identify the cells of the growth when among the leucocytes outside the well-defined margin. Here the black colour enables us to do so, and thus to give an anatomical support to the surgical axiom of removal wide of the disease.

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* Sir A. Cooper mentions a case in which the epithelioma exposed and involved the testicle; infiltration of the lumbar and retro-peritonæal glands followed.

It will be seen that Mr. Spencer's observations explain not only those cases of tardy affection of the lymphatic glands, many years after the primary growth has been successfully removed, but also those in which the groin glands become the seat of cancer, without primary disease of the scrotum or adjacent parts. Of this very rare condition, the following case is an instance (Sir J. Paget, *Surg. Path.*, 1st ed., vol. ii. p. 447) :—"The patient was a sweep, aged forty-eight, his skin was dusky and dry, and many hair follicles were enlarged by their accumulated contents, but he had no appearance of cancer or wart of any kind on the scrotum or penis, yet his inguinal glands were diseased, just as they commonly are in the later stages of soot cancer." The enlargement was bilateral, and on the right side the skin was adherent and ulcerated. The disease had been noticed for fifteen weeks, having begun as a hard lump under the skin in the right groin. Some of the glands removed showed "abundant epithelial cancer cells." Two similar cases, in which "chimney-sweep's cancer" began, not in the scrotum, but in the groin glands, are recorded by Mr. Lawson (*Lancet*, 1878, vol. ii., p. 576).

Epithelioma of the scrotum occurs most commonly about the middle period of life. Earle stated (*Med. Chir. Soc. Trans.*, vol. xii. p. 296) that though eczema and soot warts were common enough amongst boys, yet cancer did not develop until after twenty, and usually not till after thirty.* The effects of prolonged irritation, and the fact that, about middle life, the tissues of the body are becoming less resistant to irritation, play an important part in this question of age.

Some writers, *e.g.* Curling, have stated that the disposition to epithelioma of the scrotum appears to be in some cases hereditary, and the following cases are quoted. Earle extirpated the testicle and diseased scrotum in a sweep aged thirty-five, whose grandfather, father, and one brother had all perished from the disease. Hawkins (*Lond. Med. Gaz.*, 1838, vol. xxi. p. 842) had a father and son under his care at the same time in St. George's Hospital with epithelioma of the scrotum. Cusack (*Dublin Journ. Med. Sci.*, 1842, vol. xxi. p. 137) removed a soot wart from the hand of a woman who carried on a chimney-sweep's business. Twelve years before he had removed a soot wart from the ear of her son, and another son had died of cancer. Before attaching much importance to "inherited predisposition" in such cases, we must bear in mind the effects of prolonged irritation and similar uncleanly habits.

Epithelioma of the scrotum is a rare form of cancer when compared with the other instances of epithelioma with which surgeons have to deal. Save in chimney-sweepers, it is extremely rare. I have mentioned one case in the footnote below, though of course epithelioma may begin in a wart here as elsewhere. Kocher states that Dr. Schaffner of Heidelberg had informed him that he had often observed epithelioma scroti in Mexico amongst the muleteers, these people being noted for being very dirty, and being exposed to manifold irritation of the scrotum from ill-made saddles, and constantly mounting and dismounting.

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* Occasional exceptions occur in cancer of the scrotum, as elsewhere. Thus Sir J. Earle saw a case in a boy of eight. Wadd (*Cases of Diseased Prepuce and Scrotum*, pl. xii.) has figured a soot-wart on the scrotum of a boy aged fifteen. A case of epithelioma of the scrotum of a year's duration in a lad aged eighteen is given in the *Lancet*, 1883, vol. ii. p. 327. The cause was here unknown. The patient was a "block-cutter." There was no tendency to malignant disease in his family, and no history of irritation or injury.

In the last five-and-twenty years there have been only fifteen cases of epithelioma of the scrotum admitted into Guy's Hospital. Of these, ten cases occurred in chimney-sweeps; one in a tar-distiller, one in a gas-stoker, one in a lamp-black maker, one in a shoemaker. I shall allude to the influence of other trades and irritants a little later. Keeping at present to "chimney-sweep's cancer," we come to another point of much interest. Epithelioma of the scrotum is a very rare form of cancer, and when met with, the patient has almost always been submitted to the prolonged action of some irritant, the commonest being soot. *Is the disease becoming less common in England, and if so, what is the reason? Is it correct that this disease is almost unknown out of England, and if so, what is the explanation?*

With regard to the first question, it has of late years been generally accepted by surgeons that "chimney-sweep's cancer" was one of those forms of cancer whose importance was diminishing, that it was on the decrease, owing to the fact that chimneys are now swept from below by jointed rods, and no longer by sweeps who climb inside, using short brushes. A more important explanation than the introduction of machinery, is to be found in the fact that chimney-sweeps, being no longer employed in boyhood, the delicate scrotal skin is not exposed so early or so long to the irritation of soot. Mr. Butlin (*loc. supra cit.*) quotes some statistics of the Registrar-General, drawn up as long ago as 1885 (*Forty-fifth Annual Report*, p. 56), as not supporting this view. Mr. Butlin also states that from an examination of the statistics of St. Bartholomew's Hospital during the last twenty years, he is of opinion that scarcely a year has gone by without a case of chimney-sweep's cancer, and that the number of cases during the last ten years was quite as large as the number during the preceding ten years. On these grounds Mr. Butlin looks upon the belief that "chimney-sweep's cancer" is now on the decline as a "false impression."

While one hesitates to differ from an acknowledged authority on malignant disease like Mr. Butlin, I cannot agree with him. In the first place, to judge of the decline of a disease in 1892, we want more recent statistics than those of 1885. Again, to complete our comparison between the frequency of a disease fifty or a hundred years ago and at the present day, we want figures of the number of cases admitted at the above dates: these we shall never have, as no hospital reports were then issued. "Chimney-sweep's cancer" may never have been a frequent disease, but when it is stated that it is a disease of decreasing frequency, this means in comparison with forty or fifty years ago; of the real frequency of the disease at this time we shall never have reliable information. The statistics for Guy's Hospital for the last twenty-five years, and my experience as a member of the surgical staff for seventeen years, are not in accord with Dr. Butlin's opinion. Thus, in the twenty-five years between 1867 and 1892, there have been only fifteen cases of "chimney-sweep's cancer" admitted into Guy's Hospital, the last case being in 1886. Since this date we have not had a case of chimney-sweep's cancer, though there have been two cases of cancer of the scrotum admitted: one in a lamp-black maker and one in a labourer at a gasworks. If I am right in my belief that chimney-sweep's cancer is a disease of greatly diminished frequency, the explanation of this must be sought not so much in the change of the mode of chimney sweeping, but in the fact that the last twenty-five years have seen a change for the better as to habits of improved cleanliness amongst the so-called "working classes." Again, the same period of time has seen some improvement in the spread of information and in the rise of intelligence in the same rank of life. The sweeps of the present day are more alive to the risks of soot irritation and its results. They, like their fathers, have heard of the danger of soot cancer, but they show more intelligence in availing themselves of the means of avoiding it; furthermore, they know well that with anæsthetics surgical operations have been robbed of much of the horror with which they were looked upon fifty years ago. We have seen the same result in another disease of late years—viz., malignant pustule—where the recognition on the part of those who handle raw hides of the risks they run, has led to great attention being paid to any crack, abrasion, or pimple, and to a marked diminution in the number of cases admitted into Guy's Hospital.

With regard to the second statement, also generally accepted in this country—viz., that "chimney-sweep's cancer" is extremely rare in other countries—Mr. Butlin thinks there can be no doubt of its accuracy. He considers that the explanation lies not so much in the fuel burnt and the mode of burning it, but in the great precautions taken by sweeps of the Continent to avail themselves to the full of every protection given by special clothing and frequent thorough washing.

Another most important question remains, *what other trades besides that of chimney-sweeping predispose to cancer of the scrotum.*

During the last twenty-five years, in addition to the fourteen cases of chimney-sweep's cancer, ten cases of primary cancer of the scrotum have been admitted into Guy's Hospital. Of these ten, three occurred in patients employed at tar works, three in labourers at gas works, one in a chemical labourer, one in a lamp-black maker; the two remaining cases are described as occurring in a shoemaker and a labourer. Substances which seem to be certainly harmful are paraffin, tar, and, perhaps, crude carbolic acid. The late Prof. Volkmann (*Beiträge z. Chir.*, 1875, S. 370) published a paper on "Tar, Paraffin,* and Soot Cancer." Dr. Joseph Bell (*Edin. Med. Journ.*, 1876, p. 135) reports briefly two cases of epithelioma of the scrotum, ascribed by the patients to the fumes ofparaffin and contact with the oil. As had been shown by Prof. Ogston (*Edin. Med. Journ.*, 1871, p. 544), both tar and paraffin can cause acute and chronic skin eruptions—*e.g.*, psoriasis, acne, and enlargement of the sebaceous glands. Volkmann describes little knots of epidermis, tiny horns, and flat, dirty brown scales and crusts. He found that these were especially frequent on the forearm and scrotum, and that in the latter spot they were especially liable to become moist and offensive. Dr. Ball, of Dublin (*Lancet*, 1884, vol. i. p. 477), described a case of scrotal epithelioma which occurred in a man, aged forty, who for nine years had worked as a distiller of crude carbolic acid from tar. Inquiries were made as to the health of the other workmen. One man was seen with a large number of epitheliomatous warts over the body, and Dr. Ball was informed that two men who recently worked at the distillery had horns followed by open sores on the face, but he was unable to trace these cases. It appeared that the fumes given off in the destructive distillation of tar produced an irritation liable to pass into epithelioma. In 1889 Prof. Volkmann informed Mr. Butlin that since precautions had been taken by the manufacturers with regard to baths, &c., paraffin cancer had become much more rare.

Treatment.—This is, of course, primarily preventive. The details of cleanliness adopted by Continental sweeps, as to an especial protecting dress, and frequent and complete washing, are fully given by Mr. Butlin (*loc. supra cit.*). In the case of any papilloma or epithelioma, thorough wide removal should be practised as early as possible: in many cases all that is needed is an elliptical incision sufficiently free of the disease, and passing through the whole thickness of the scrotum. In more extensive cases, the patient being in lithotomy position, incisions may have to be made from each external ring to the raphé of the perinæum, skirting the back and outer sides of the scrotum, and joined above by one passing under the penis. Plenty of Spencer Wells's forceps should be at hand for the arrest of bleeding, a staff should be placed in the urethra, and where, owing to extension of the disease, a tedious and, very likely, a futile dissection will be required to save the testicles, one or both of these should be sacrificed. The parts should be carefully cleansed beforehand, and irrigation with lot. hyd. perch., 1–2000, kept up during the operation. Adequate drainage should be provided.

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* In a case of Tillmann's quoted by Kocher, a worker in paraffin, after successful removal of a scrotal epithelioma, became the subject of epithelioma of the forearm, which proved fatal from extension to the axillary glands. This case may be compared with that of Earle, in which a gardener became the subject of soot-cancer of the hand from strewing his young plants with soot. Tillmann draws an analogy between the above causes of chronic irritation and their results, and the influence of tobacco on the mucous membrane of the mouth and lips.

If it be possible, any enlarged glands should be removed at the same time. I have dealt with this matter, fully, when considering the more common removal of enlarged glands secondary to epithelioma of the penis.

SECTION II.

MELANOTIC GROWTHS OF THE SCROTUM.

At first sight, considering how rich is the rete Malpighii of the scrotum in pigment, and how common are melanotic growths of the skin elsewhere, it is remarkable that melanotic growths so seldom occur here. This is perhaps accounted for by the rarity of moles or warts on the scrotum, compared, for instance, with their frequency on the lower part of the chest or abdominal wall.

The following points should be remembered with regard to melanotic growths here, as elsewhere. They are often extremely insidious, both in their commencement and their course. Yet in spite of this insignificant commencement and apparently unimportant progress, there are no growths which can be more malignant. They do not always infect the glands. Histologically, the growth is usually a melanotic sarcoma, containing round and spindle cells, and presenting a matrix which very often forms definite alveoli.* Finally, it is a growth which is especially liable to commence in and to be hastened by any irritation. Thus removal, by the knife, at the earliest possible moment is imperatively needed.

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* See an exquisite illustration of an alveolar melanotic sarcoma of the skin in Mr. Bowlby's *Pathology*, Fig. 23. The above fact may account for

The following case is recorded by Mr. Curling. A cabinet-maker, aged thirty-two, consulted him Nov. 1842, for a fungous growth on the scrotum. This was about the size of a walnut, of a dark colour, with an irregular surface, and attached to the left side of the scrotum by a narrow peduncle. About an inch to one side of the growth was a small dark spot, apparently produced by some black deposit beneath the epidermis, raising it a little above the surrounding surface. The patient stated that the fungous growth was first noticed about three months before, when it resembled the little speck just described, which had only been observed a fortnight. It had increased rapidly of late, but gave no pain. The shirt was discoloured by a slight bloody discharge. There was no enlargement of the glands in the groin. Mr. Curling excised the growth and the adjacent speck. In May 1843, the patient returned on account of a recurrence. There were now three black specks on the scrotum near the cicatrix, and the glands in the left groin were slightly enlarged and indurated. In March 1844, there was a firm mass, about the size of an almond, in the scrotum, implicating the cicatrix, and an enlargement of the inguinal glands, forming a swelling the size of an orange, and a smaller swelling, the size of a hen's egg, just below it. The patient now suffered much pain. Mr. Curling saw no more of the patient till October 1848. The swelling in the groin had now reached the size of a very large cocoanut; that in the scrotum had increased very little. Death took place Dec. 7, 1848. The lumbar glands were slightly enlarged and quite black. The thoracic and abdominal organs were all sound. Mr. Curling draws attention to the fact, as contrary to the usual course of melanotic growths, that though the disease reappeared *in situ*, and also in the groin, so soon as six months after the operation, it advanced subsequently so slowly that, after lasting six years, the only internal parts affected were the lumbar glands.

The second case is reported by Dr. Rouge, of Lausanne ("Cancer mélanique du Scrotum," *Bull. de la Soc. méd. Suisse romande*, Oct. 1868, p. 315). The patient, aged fifty-four, was a

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M. Rouge's case below being described as containing "cancer cells" and "cancer stroma."

watchmaker. Three years before he had noticed a black spot on the right side of the scrotum. Oct. 18, 1868, the disease was of the size of a two franc-piece, showing a bluish-grey centre, and around it a moist, rosy-red margin slightly raised. The inguinal glands had been swollen, on both sides, for a year. The growth was removed, and the patient is stated to have been well five months later. The examination showed a growth in the subcutaneous tissue adherent to the tunica vaginalis. Its exact histology is not made plain. "Cancer cells" and "cancer stroma" are spoken of.

Paget's Disease.—An instance of this disease, which is very rare in the scrotum, has been described by Dr. Crocker (*Path. Soc. Trans.*, 1888). The patient was a white-smith, aged sixty, and the disease had existed over two years. Without any known cause a superficial ulceration began on the scrotum and under aspect of the penis, somewhat resembling eczema, but very sharply defined, and evidently deeper than an ordinary dermatitis. In spite of a great variety of treatment, both internal and external, the disease gradually extended, two nodules ultimately appearing, one of the size of a pea, the other of a large bean. The malignant nature of the affection was then apparent, and its similarity to the disease of the nipple recognised, an analogy in which Sir J. Paget concurred. The whole diseased area was excised by Mr. Godlee, and six months later there had been no recurrence.

A microscopical section showed an alveolar structure, the alveoli containing collections of small epithelioid cells, suggesting in many respects the structure of rodent ulcer.

Dr. Crocker thought that the affection might, perhaps, have been a rodent ulcer, arising in an abnormal situation, and taking on an abnormal form, but that it was unusual to meet with such large nodules. It differed from epithelioma in its starting-point, which seemed to be in the appendages of the skin and not in the epidermis.

CHAPTER III.

NON-MALIGNANT NEW GROWTHS OF THE SCROTUM.

THESE are of but little importance. They include vascular growths or angeiomata, sebaceous cysts, fibromata, lipomata, and fibro-cystic disease. The first two alone are at all common.

Angeiomata or Vascular growths.—These are usually congenital. They are not very uncommonly met with as scrotal nævi, usually cutaneous. These should be destroyed early with the thermo-cautery. Excision is rendered unadvisable at this early age by the difficulty of keeping the parts clean.

Vascular growths show themselves, under different conditions, later on in life. They are probably the same vascular nævoid growths which, later on, undergo fibroid, cystic, or fatty change. In a case of Mr. Holmes (*Path. Soc. Trans.*, vol. xv. p. 95), described as "congenital venous tumour of scrotum," in a boy, aged ten, the swelling originally congenital, and long stationary, had begun decidedly to increase.

The skin was sound over the swelling, though presenting the venous colour very plainly; beneath it numerous masses, more or less round and hard, could be felt. One of these much resembled the testicle, though it was much harder than the natural organ. The cord could not be traced below the external ring, where it seemed to be lost in the mass. Otherwise nothing could be felt but a congeries of greatly enlarged veins; there was no pulsation. The other side was healthy. It is noteworthy that blood had escaped, though not in very large quantity, by the urethra. The swelling was treated by subcutaneous ligatures, and considerable benefit followed.

Dr. Humphreys records (*Brit. Med. Journ.*, 1888, vol. i. p. 19) an interesting case of this kind in which the same complication occurred. A patient, aged thirty-four, sent for him for somewhat severe hæmorrhage from the urethra. The entire left side of the penis and scrotum, and of the perinæum to within two inches of the anus, presented one mass of varicose veins. There was an enormously dilated venous pouch where the vein passed out of sight near the anus. The condition was congenital. The hæmorrhage was arrested by passing a catheter and bandaging the penis on to it, the bleeding coming apparently from a ruptured vein about three inches up the penile urethra.

Mr. Rivington recorded another case (*Lancet*, 1878, vol. ii. p. 608) in a patient, aged twenty-three. The swelling here, consisting of firm nodules intermixed with softer structures, occupied the back of the left half of the scrotum. After excision it was found to consist of lobules composed of a congeries of irregularly dilated veins, interspersed with small connections of fat and fibrous tissue.

These growths should always be removed early, owing to their tendency, if left, to inflame, ulcerate, to bleed, and to pass into a different or sarcomatous condition later on. The liability of this region to irritation must not be lost sight of.

Sebaceous Cysts.—These are decidedly uncommon in this region. I have only met with one case; in this thirteen sebaceous cysts of very varying size were met with in the scrotal skin of a patient, aged forty-one, a clergyman who came for the treatment of an ulcerated sebaceous cyst in the left side of his neck, and another in the left groin. Mr. Hutchinson figures (*Illustr. of Clin. Surg.*, vol. ii. pl. 68) an instance of a very rare change in the scrotal sebaceous glands. "Instead of shrinking as age advanced, these glands had developed into tumours of considerable size, which finally contained a dry, almost cretaceous substance. They had been very slowly forming for upwards of fifty years. There was no tendency to a formation of similar tumours elsewhere." Mr. Hutchinson remarks that the scrotal sebaceous glands vary very much in size in different individuals. In many young adults they are as large as swan-shot and sometimes almost as hard; as age advances, they usually slowly diminish. He thinks they are most frequently large in the subjects of acne who have a liberal development of the sebaceous gland system.

Kocher (*loc. supra cit.*, Chap. XIV.), from his experience, seems to have met with sebaceous cysts much more frequently, going so far as to state that the scalp is the only place where they are met with more frequently than on the scrotum.* Whether this be due to the less cleanly habits of his patients or no, this experience is quite contrary to that of English surgeons. They are usually multiple and small, never attaining to the size reached by sebaceous cysts of the scalp. He considers that the raphé is the principal seat of the cysts, being a part "anatomically distinguished by particularly plentiful sebaceous glands." Calcification and cretification of the contents and of the cyst wall occur more frequently in cysts of the scrotum than in those of the scalp. The same writer refers to an interesting case of compound sebaceous cyst in the Museum of Wurzburg. Here the scrotum seems to have contained three cysts, two lateral and one median. The lateral ones were of the size of a fist and a goose's egg respectively. Their contents were crumbling material, and thick scales and shreds. The walls were partly calcified. The median cyst lay in the septum scroti, and in structure might be called an adenoma of the sebaceous glands. Thus, microscopical examination showed a connective-tissue cyst wall, containing numerous tubular cul-de-sacs filled with epithelial accumulations in which retrograde metamorphoses had taken place.

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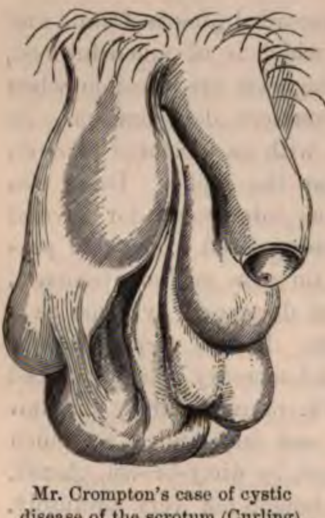
* Prof. Hoffmann, of Basle, informed Prof. Kocher that every year he met with two cases amongst the subjects brought for anatomical examination.

Diagnosis.—Dr. R. W. Taylor has recorded (*Journ. Cutan. and Gen.-urin. Dis.*, 1890, p. 379) a case which is of much interest, showing as it does what errors of diagnosis are possible when sebaceous cysts have undergone inflammatory degeneration. In 1883 a man, aged twenty-three, came with an ulcerated mass on the anterior aspect of the scrotum, near the raphé. There was no history of syphilis or of suspicious intercourse for several years. For over a year the patient had noticed a movable pea-sized swelling which had given him no pain or inconvenience. On two occasions it inflamed and was diagnosed by some as a furuncle, by others as a hard chancre. It was treated locally by caustics and mercurial ointment, and mercury was prescribed internally. Dr. Taylor found a hard, round, sharply circumscribed swelling, not freely movable and surrounded by much inflammatory œdema. It was covered by dirty-brown, glazed, necrotic tissue which discharged pus, though not very profusely. There was no enlargement of glands, and no evidence of syphilis. The growth was excised and the patient did well.

Treatment.—Owing to the exposure of this region to irritations of different kinds, and the frequency with which sebaceous cysts, if irritated, especially in later life, undergo serious degenerations, these growths should always be extirpated early. Where the skin is thin and adherent it will be better practice, owing to the laxity of the scrotal tissues, to excise them, together with their covering of skin, by elliptical incisions, as this will better ensure complete removal and primary union.

Cystic Tumours of the Scrotum, other than Sebaceous.—These are very rare. I have placed them here because it is possible that though so different in appearance and structure to sebaceous cysts, they really originate in the same way. The best instance of this class of cyst is one which occurred in the practice of Mr. Crompton of Birmingham, and was by him reported to Mr. Curling, from whose book (p. 623) the following account is taken: "J. A., when about eight years old, was observed to have two or three small cysts in the scrotum. They were of the size of a horse-bean, and situated beneath the integument. In the course of a few months they increased considerably in size, and fresh cysts appeared. There were, perhaps, as many as twenty or thirty, some of the size of a pea, others as large as a kidney-bean. They caused no pain or inconvenience. Mr. Elkington, who had charge of the patient, having used friction with iodine and mercurial ointments without effect, punctured the cysts several times with a grooved needle, and afterwards applied pressure with adhesive plaster, but without any advantage. The fluid evacuated was invariably transparent and serous. After the disease had existed four or five years, Elkington took the lad to London to see Sir A. Cooper, who recommended graduated pressure, which was applied for two years, but without benefit. The patient was afterwards lost sight of until he came under the care of Mr. Crompton in 1849. He was then about twenty-two. The testicles felt healthy. Below them, in the substance, as it were, of the scrotum, a number of elastic globular bodies could be felt, and behind, a hardened and inflamed portion of the integument, which was tender, and the chief source of his annoyance. The disease appeared to involve the septum, and to spread thence towards the crura of

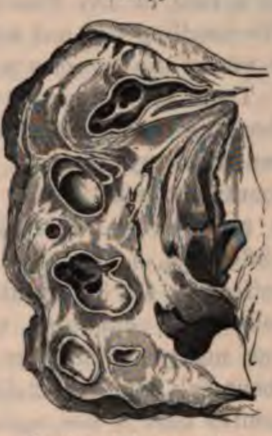
FIG. 78.



Mr. Crompton's case of cystic disease of the scrotum (Curling).

the penis. The condition of the scrotum is represented in Fig. 78. Crompton excised the whole of the diseased mass. The wound healed by granulation, and the man afterwards went to India as a soldier. The part removed resembled the cystic sarcoma of the breast (Fig. 79). The cysts were of various sizes and contained transparent fluid.

FIG. 79.



Section of above specimen (Curling).

Bauchet has described (*Arch. Gén. de Méd.*, 1858, p. 71) a case of cystic swelling of the scrotum which, forming slowly in a patient, aged thirty, had reached the size of a small hen's egg. Bauchet was of opinion that the cyst originated in an obstructed sebaceous follicle, as little masses of sebaceous material were found attached to its inner wall.

Prof. Kocher, who would look upon the cysts in Mr. Crompton's case as of the same kind as the sebaceous ones first described, though the contents are clearly so different, attaches importance to the sebaceous matter present in Bauchet's case, and to the fact that in Crompton's patient, the cysts seemed to spread outwards from the raphé, the skin of which is, according to Kocher, very rich in sebaceous glands. Against this view is the fact stated by Crompton, that the cysts were *beneath* the skin. From this, and from the appearance in Fig. 79, I should have thought that the disease here was more of the nature of molluscous fibrosum, or that congenital form of cystic disease met with in the neck and elsewhere.

Another possible mode of origin of such cystic swellings, especially when they are congenital, has been suggested by Prof. Verneuil (*Gaz. des Hôp.*, 1859). A patient of Ricord's, aged twenty-five, had in the right half of the scrotum a fist-sized swelling, masking the epididymis and testicle, and reaching up to the external ring. It was congenital, and during its growth there had been three inflammatory attacks. It felt hard, and was painless on pressure; varicose veins could be felt through the skin, together with cysts, some of which were transparent. After removal, the growth was found to be made up of fibrous and fatty tissue, with dilated veins, like those in external hæmorrhoids, and transparent cysts containing serum. Prof. Verneuil thought that the cysts originated in some of the varicose veins.

Another way in which scrotal cysts may arise is shown by a case of Dr. Fleming's (*Dublin Hosp. Gaz.*, 1857, p. 228). The swelling was met with in a boy, aged nine, after a contusion; it was of the size of a walnut, and sacculated.

There are at least two other forms of scrotal cysts, which, though extremely rare, deserve mention here. They are **hydatid** and **urinary cysts**. The following is an instance of, in this country at least, a very unusual site for an **hydatid cyst**: it is recorded by Dr. Muskett, of Sydney (*Med. Press and Circular*, 1889, vol. i. p. 142). The patient, aged twenty-five, first noticed in 1878 a swelling in the right scrotal region, beginning below, and enlarging upwards. Early in 1884, the swelling was nearly as large as two closed fists. It was tapped, and about half a pint of "dirty-looking" fluid was drawn off. Eight months later it was again tapped (a quarter of a pint of clear fluid being now withdrawn), and injected with iodine. In three or four weeks' time the swelling returned, and soon regained its old dimensions. The patient was admitted into Sydney Hospital, July 16, 1886, with an intra-scrotal swelling, about the size of an emu's egg, on the right side; this was smooth, oval, tense, dull on percussion, fluctuating, without impulse, and irreducible, The testicle was at the back part of the swelling, which was translucent. The patient was tapped the next day, and about one ounce of pale yellow, serous fluid was evacuated. After a few days the temperature rose every evening, and the swelling became hot and swollen. Six ounces of purulent fluid were withdrawn with a full-sized trocar, and a few days later it was proposed to lay the sac freely open. Just at this time, however, an hydatid sac forced itself through the opening left by the trocar. It was unmistakable, and in its collapsed state would have filled an egg-cup. The patient was cured.

Urinary Cysts.—It is of course well known that extravasation of urine generally leads to extensive sloughing, and that in rare cases, with a less acute course, circumscribed abscesses are formed. There is another still rarer class of case, in which the urine, escaping through very small perforations in the urethra, causes exudation of inflammatory products, which assume a tumour-like character. Paul Satre (*Thèse de Paris*, 1874), has described six such cases. Still more rarely a cyst-like cavity is formed, which, filling with urine, may persist for years. Karewski

(*Centr. f. Chir.*, Bd. xxxii., 1887) observed the following case: A patient, aged fifty-four, had gonorrhœa ten years before, followed by stricture, which was treated by bougies. Seven years later, an abscess formed near the anus, which was opened, giving vent to much pus. Shortly after the scrotum began to swell: the diagnosis of a hydrocele was made, and the swelling tapped, clear, water-like fluid being evacuated. The tapping was twice repeated. There was no difficulty in micturition. The scrotal swelling was of the size of a fist, not involving either testicle or cord. The swelling fluctuated; a firm band could be felt leading from the posterior part of the swelling to the region of the prostatic urethra. A No. 12 catheter could be passed without difficulty. The urine was clear and normal. Pressure in the swelling caused clear, urinous fluid to pass out of the urethra. When the swelling was tapped, a turbid yellow, urinous fluid, containing flocculent shreds, was drawn off. The fluid was neutral, with traces of albumen and large quantities of urea. The shreds consisted, microscopically, of pus cells. M. Satre advances the four following conditions as necessary to explain this form of urinary cysts:—(1) An impediment to the normal evacuation of urine. It is doubtful whether this is absolutely necessary. (2) An abnormal opening into the urethra. (3) An acid, undecomposed urine. (4) Gradual extravasation of a small quantity of urine. In some cases, as in the one given below, an abscess, traumatic in origin, and independent of any stricture, precedes the formation of a cyst, and after the pus has been evacuated, the urine obtains access to the cavity. The size of the cyst will depend partly on the size of the preceding abscess and partly on its position. Thus it will be larger in the scrotum than in the perinæum, where its coverings are tense and resistant.

Mr. H. W. Page records (*Med. Chron.*, 1887, vol. vii. p. 194) the following case of urinary cyst of the scrotum: The patient, aged forty-five, had, eighteen months before, received a severe blow on one testicle. The testicle had since increased in size and hardness. He attended at St. Mary's Hospital as an out-patient, and Mr. Silcock detected, in addition to the orchitis, a swelling in the mid-scrotal region, the size of a small apple, firm, smooth, indistinctly fluctuating, and apparently attached to the urethra, about an inch in front of the bulb. On the passage of a No. 9 catheter, there was much tenderness opposite the swelling. When the swelling was tapped, offensive, urinous pus was withdrawn. The cyst was laid open and scraped out. It was found to be in close connection with the urethra. The testis seeming useless, this was removed. As the opening into the urethra was accidentally enlarged to half an inch with the sharp spoon, precautions were taken to prevent a fistula by the careful use of india-rubber catheters. The patient recovered completely. In this case, the sequence of events seemed to be that the blow started a chronic and singularly painless inflammatory process, that this formed a sort of cyst in the lax peri-urethral tissues; and that at some time a communication formed between this and the urethra, producing thus a urinary cyst. The resemblance to a true cyst could not have been more striking.

Treatment.—This will be gathered from the above given cases. Incision and careful scraping out of the cyst with attention to drainage. To prevent the formation of a fistula, the patient should draw off every drop of his urine, till all is soundly healed. If any stricture is present, this will of course require treatment.

Fibromata, fibro-myxomata, sarcomata, growths of the connective-tissue type, may occur in the scrotum, as masses of varying size, and of fibrous tissue of varying density, in some cases as hard as in a fibro-myoma, in others loose and œdematous. The growths are usually encapsulated, and often lobulated. Those of looser consistency recall the molluscous fibromata, occasionally met with of huge size, growing from the female labium. The softer growths may be combined with fatty tissue, and the denser ones may contain cartilage, or show signs of calcification. Sir James Paget records two cases (*Surg. Path.*, p. 464), interesting in their size, and in the termination of one of them. In one the patient was seventy-four, and the growth had existed for four years. It was a huge mass, about a foot long, and six or seven inches wide, filling the scrotum, and drawing over it all the adjacent integuments. A collection of fluid, like a hydrocele, lay at its lower part; a large vaginal sac was above it, and the scrotum was thick and œdematous. The patient died about half a year afterwards. The growth had attained the weight of twenty-four pounds; the testicle, with a distended tunica vaginalis, lay pressed down below it, and the hernial sac was clear of it above. The growth was easily separable from the surrounding tissues, into which many lobes of various sizes and shapes extended far from the chief mass. In the other case the patient was aged seventy, and the growth had been nine years in progress before his death. It was first noticed as a hardness just above the testicles, but as it constantly increased in size, it filled the whole scrotum, displacing the adjacent integuments, and looking at first sight like an enormous hydrocele. Its surface was uneven and lobed, in some parts feeling hard and brawny, in some soft and fluctuating. The growth for many years was only inconvenient from its size and weight, but, about a month before death, one of its prominent parts sloughed, and hæmorrhage took place. After this extensive sloughing followed, with much hæmorrhage, and the patient sank. M. Lesauvages has recorded (*Arch. Gén. de Méd.*, 1845, t. ix. p. 212) the case of a fibrous growth of the scrotum, in a patient aged seventy, which weighed at least forty-four pounds, and was so large that when the patient sat with it resting on his thighs, it reached beyond his knees and up to his sternum. As an instance of a "fibro-cellular" growth in a much younger patient, Mr. Curling mentions one on a boy aged two and a half.

The following case of "fibro-cellular tumour in the scrotum" was recorded by Mr. Hilton (*Med. Times and Gaz.*, 1853, vol. ii. p. 679). The patient, aged thirty, was admitted for a large solid tumour in the scrotum. This had been first noticed six years previously in the situation of the external abdominal ring. It was then about the size of a hazel-nut, and gradually increasing descended into the scrotum. Except for much aching, especially after exercise, the growth had been unattended with pain. The swelling was nearly as large as two fists, oval, and with well-defined smooth outline. On its upper and anterior surface was a large, round outgrowth attached to it by a broad base. The sensation given to the finger in all parts was that of a firm, solid tumour. The growth filled the scrotum, lying in front of the cord. The skin was free all over it, and the testicle could easily be felt as detached and movable from the growth to a certain extent. At the operation for its removal the growth was found to possess but few attachments save to the tunica vaginalis, to which it adhered so firmly that a portion of that membrane had to be removed with it. The patient made a good recovery.

The above case may perhaps be looked upon as a sarcoma. Another instance of sarcoma of the scrotum is given by Kocher, but this appears to me to have begun in the groin and to have extended thence into the scrotum.

Dr. Gerster brought a specimen of an enormous fibrous sarcoma of the scrotum before the New York Academy of Medicine (*Journ. Cutan. and Gen.-urin. Dis.*, 1891, vol. ii. p. 62): The patient, aged forty-five, had noticed three years before a hard lump below the left testicle. For two years the swelling grew very slowly, latterly its growth had been more rapid. The swelling measured fifteen inches vertically, and twenty-six in circumference; it fluctuated anteriorly; there were no enlarged glands. At the operation for its removal, the penis and right testicle were first dissected out, and adequate skin preserved to cover them with. The growth was then removed, together with the left testicle. It consisted of a solid mass, in form resembling that of a testis. The tunica vaginalis was enormously thickened and contained about two quarts of hydrocele fluid. The scrotal integuments were hypertrophied and contained masses of fat, having the character of a lipoma. The growth was soft, translucent, and gelatinous in structure. It was surrounded by a dense, white, connective-tissue capsule, closely attached to, but not continuous with, the tunica vaginalis. The testicle was intimately adherent to the side of the growth, flattened, but apparently intact. The starting-point of the growth was apparently in the tissues between the corium and the tunica vaginalis. Its minute structure was that of a fibro-myxoma.

Diagnosis. — A small fibrous growth in the scrotum may be mistaken for an encysted hydrocele or "a third testicle." When a growth of larger size is under consideration it may be quite impossible to make out whether it has started in the scrotal wall, the tunica vaginalis, or the epididymis.

Treatment.—These growths should always be removed early. The surgeon must be prepared for adhesions between the growth and the tunica vaginalis, or the cord which may necessitate castration.

Chondroma and Osteoma.—The following case is quoted by Curling. Dr. Kerr has described (*North Amer. Med. Chir. Rev.*, Jan. 1858) the case of a Chinaman, aged twenty-eight, with a hard, dense, slowly growing scrotal tumour of the size of an infant's head. It was excised, together with the left testicle, which lay below it. It weighed five pounds, and consisted of numerous cartilaginous lobes, in with much bone was developed, many hard spiculæ being scattered through the tumour. True bone was proved to be present.

Lipoma.—Fatty growths, with characteristic lobules and definite capsule, may be found in the cellular tissue of the scrotum.

They are very rare, and this fact, together with their softness and pseudo-fluctuation, may readily lead to mistakes. It is probable that these growths originate in the spermatic cord (p. 513) and travel downwards. Sir J. Paget alludes (*Surg. Pathol.*, p. 451) to this shifting of fatty tumours. He mentions one case in which a pendulous lipoma had gradually moved downwards from the groin into the perinæum. In another case the growth began in the spermatic cord, and thence had partly extended and partly shifted into the scrotum behind the testicle, where it was extremely difficult to decide its nature.

Another form of lipoma may be referred to here as a lipoma in connection with the genitals, though not, strictly, a scrotal lipoma. An excellent instance is figured by Mr. Hutchinson (*Arch. Surg.*, vol. iii. No. 60, pl. lxiii). It occurred, as is usually the case, in a man of middle age, and one who was accustomed to the liberal use of malt liquors. This diffuse lipoma of the pubic region did not actually invade either the scrotum or the penis, although these parts were almost buried in the masses of fat which surrounded them. These masses were so large as to be conspicuous through the patient's clothes, and to greatly impede him in walking. They were successfully removed after what proved to be a rather formidable dissection. There were similar diffuse lipomata in the nape of the neck. These remained stationary under the influence of entire abstinence from beer, and the use of the sulphide of calcium in full doses.

CHAPTER IV.

SCROTAL ELEPHANTIASIS.

ELEPHANTIASIS occupies a position midway between chronic inflammation and growths (Kocher). In the earlier stages it presents itself under the form of recurrent inflammatory attacks, later on, it approximates more to a new growth.

Elephantiasis is very common in certain hot climates, especially the East and West Indies, Ceylon, Egypt (more particularly in the neighbourhood of the Delta), China, Japan, in some parts of South America, and in some parts of the Pacific. It is said to attack natives of the poorer class, especially those who habitually wash in stagnant waters, or who walk barefoot. Europeans very rarely suffer from it. A few cases have been noticed in Europe (*vide infra*).

The disease consists in a chronic hypertrophy of the skin and cellular tissue, which may produce enormous enlargement and deformity; this hypertrophy follows on an inflammatory œdema which is set up by repeated attacks of erythema and dermatitis, called erysipelas. The inflammatory œdema which is the "characteristic lesion, gradually becomes œdema durum, and no longer yields to pressure, the infiltrated tissues undergo hypertrophy, and masses of fibrous tissue are thus produced which may be described as a diffuse new growth. The skin itself appears at first to be unaffected, at least in its papillary and epidermic layers, but after a time it also hypertrophies, the papillæ becoming enlarged and the surface coarse, thick, scaly, and pigmented. *Histology.*—On section, the hypertrophy of the deeper layer of the cutis and the massive fibrous bands of white and elastic tissue, with œdematous connective and adipose tissue, are very characteristic, the lymph-spaces of the cutis are enlarged and the lymphatic vessels are often found dilated and varicose" (Pye-Smith). The deeper parts—*e.g.*, the testicles—are healthy. Hydrocele is common. Hæmatocele is occasionally present.

The above-mentioned œdema and hypertrophy are due to obstruction of the lymphatics of the scrotum. This may be brought about by various causes, but by far the most important, and the cause of the elephantiasis most frequently met with, as endemic in the countries mentioned above, is a parasitic nematode, the embryo of which is known as "filaria sanguinis," while the parent worm has been called Filaria Bancrofti,* after the discoverer. Not the least of the many interesting points with regard to the filariæ and elephantiasis is, that they supply a progressively acting cause in explanation of a chronic, progressive series of inflammations. The natural history of these entozoa, their size and movements, the behaviour of the embryos of the filariæ while in the blood-vessels of their first host, their further development in the female mosquito, their probable passage from the dead body of this insect into water, and their introduction afresh into the human body in drinking-water, their passage from the stomach, by a process of boring, into the thoracic duct, and thence up stream until they reach a resting-place in the lymphatics which form the duct—all these points will be found described in full in standard works on medicine (*e.g.*, Fagge and Pye-Smith's *Medicine*, vol. ii.: "Chyluria"; Dr. Taylor's *Medicine*, p. 762). How the filariæ, when they have found a resting-place in the lymphatics, bring about an obstruction so as to produce such affections as elephantiasis, lymph-scrotum (Fig. 82), or chyluria from a rupture of dilated lymphatic vessels upon the mucous surface of the bladder, has not yet been cleared up. The hypothesis usually accepted is, that formulated by Dr. Manson (*Path. Soc. Trans.*, 1882). This authority, to whom we owe so much of our knowledge of this parasite, believes that as long as the female parent, which is naturally viviparous, gives off embryos of the ordinary kind—viz., filiform, about $\frac{1}{90}$th inch long and $\frac{1}{3200}$th inch broad (*i.e.*, of a diameter not greater than that of the leucocytes which circulate through the lymph glands)—these pass from the lymphatic vessel in which the parent nematode lies through the lymphatic glands into the thoracic duct, and so into the blood-vessels. Such embryos Dr. Manson considers to be innocuous to the host. But from time to time other ova, he believes, are given off by the parent. These are of a very different kind, being broader and shorter—viz., $\frac{1}{750}$th inch in diameter by $\frac{1}{500}$th inch in length. Such broad ova, especially if produced in numbers, would of course block the lymphatics and lymphatic glands. As the anastomosing channels gradually become obstructed, more or less complete stasis of lymph would occur, leading to such extraordinary results as elephantiasis of a limb or of the scrotum, lymph-scrotum, or chyluria.

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* Dr. Bancroft, of Brisbane, found, in 1876, a dead specimen "in a lymphatic abscess" in the arm, and, subsequently, four living ones in a hydrocele of the spermatic cord. They were all females; and as yet, no perfect specimen of a male has been found. In 1880, Dr. Manson, while operating on a case of lymph-scrotum, removed from a dilated lymphatic part of a living worm.

Of causes of elephantiasis scroti, other than the endemic variety, less is known. It may probably originate *ab intra* in certain obstructions of the thoracic duct, of inflammatory or cicatricial origin, or in enlargement and matting of the lower abdominal lymphatic glands. In a few other cases it may begin *ab extra*, as in the cases of elephantiasis of the leg originating in this country in a chronic ulcer, complicated with repeated attacks of erysipelas, and leading to increasing dermatitis. But cases produced in these ways do not usually attain to the size and severity of those of the endemic variety. A case of non-filarial elephantiasis which is exceptional as to size, and which is of great interest on account of its origin, has been related by Mr. Hutchinson in his *Archives of Surgery*, vol. i. p. 259. "A very remarkable example of elephantiasis of the scrotum in a patient who had never left England, and in connection in the first instance with tertiary syphilitic inflammation, came under my notice in February 1887. The patient was an old gentleman of seventy-six. He was in good health, though greatly inconvenienced by the huge mass he had to carry about with him. His scrotum was as large as two adult heads, and measured about thirty-six inches in circumference. It was in a condition partly of elephantoid hypertrophy, and partly of solid œdema. The hypertrophy was strictly confined to the scrotum, and did not involve the thighs or pubes. Nor was the skin of the penis or prepuce materially thickened, though the penis itself was almost buried in the mass. It was possible that part of the bulk might be due to hydrocele, but the great thickening of the overlying skin prevented any accurate diagnosis. Exploratory punctures had been made before I saw the case, but without result. It was said to have been twenty years in process of enlargement, but it had increased more rapidly of late. The connection of the disease with syphilis in the first instance was made probable by some deep scars at the root of the penis. These had been left by tertiary ulcerations, and there were many others on different parts of the body. More particularly, the whole of one buttock was in a condition of irregular scars consequent upon lupoid ulceration. The date of the primary syphilis was upwards of forty years before, and the syphilitic lupus had been cured twenty years before. During these last twenty years he had enjoyed excellent health, his only trouble being a gradual increase in the size of his scrotum; the latter had no doubt taken its origin in the œdematous inflammation which had been produced by the lupoid ulcers at the root of the penis. This solid œdema had never disappeared, owing to the pendulous position of the parts implicated."

In this we see an ordinary exemplification of the laws which influence the production of elephantiasis. Although the disease began in connection with a syphilitic inflammation, its further development had no especial association with syphilis.

Mr. Hutchinson gives another case (*loc. supr. cit.*, p. 260) which showed the early stage of scrotal elephantiasis, the disease here being due to the proximity of long persisting syphilitic inflammation which had entirely destroyed the prepuce by ulceration. This ulceration, which was becoming thickened and tuberculated, extended from the destroyed prepuce on to the skin of the penis, and a little upon the scrotum.

It should be stated in this place that the authority just mentioned does not believe that there is any real distinction between the elephantiasis of the tropics and that which occurs in Great Britain (*Clin. Surg.*, vol. ii. p. 49). "A difference in the degree of frequency is, so far as I can see, the only one that can be traced. There can be no doubt that an unhealthy climate, the exposure to a hot, moist atmosphere, and other influences which impair the general tone of the system, have a very important influence in favouring the development of elephantoid conditions. It is probable also that the presence of the filaria sanguinis hominis takes its share in aggravating the disease, but abundant clinical facts make it quite impossible to believe that this parasite is the sole cause of the disease, or of any peculiar form of it." A little later (p. 121) Mr. Hutchinson, having stated his experience that elephantiasis of the leg is more common in English practice than our systematic works would lead us to suppose, admits that we never see, except in imported cases, severe forms of elephantiasis affecting the male genitals.*

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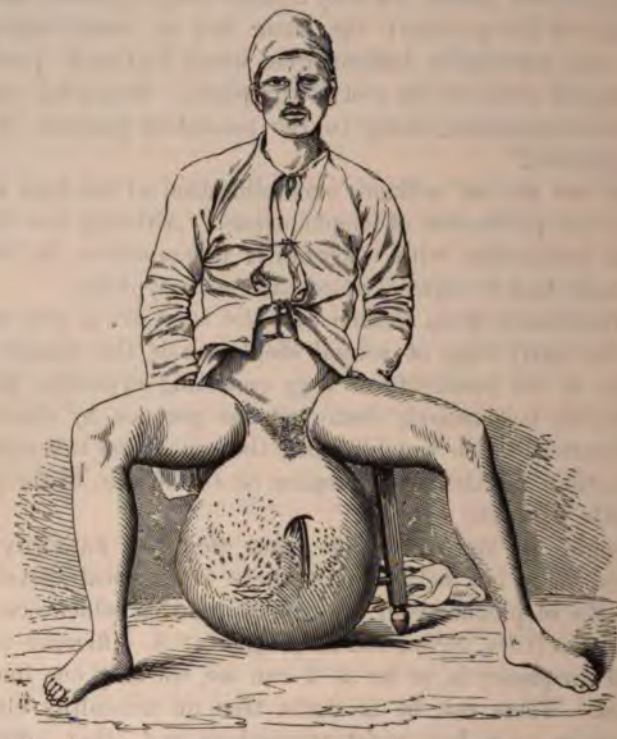
* An aggravated condition of elephantiasis affecting the external genitals in the female, and due, in the first place, to œdema after gonorrhœa, and recurrent

Mr. Hutchinson suggests that it is in "this class of cases that the filaria is efficient in causing aggravation of the malady."

Symptoms.—As has been stated, elephantiasis is associated with recurrent attacks of pyrexia, erysipelas, local heat, pain, and swelling in the groin-glands, the scrotum remaining further increased in size after each attack. Between the attacks good health may be enjoyed. When the disease is established the enlargement increases gradually and steadily, independently of pyrexial attacks. As the scrotum enlarges the penis is gradually drawn in, and ultimately disappears, being completely embedded in the swelling, the navel-like aperture of the prepuce being situated on some

FIG. 80.



From a patient of Mr. Farquhar, of Alexandria. After excision the mass weighed 70 lbs., the fluid of two hydroceles having drained from it (*Lond. Med. Gaz.*, vol. xlv. p. 192). (Curling.)

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attacks of erysipelas, must be familiar to any surgeon who has had experience of venereal wards.

part of the anterior surface (Fig. 80), or even at the very end of the tumour. As the skin of the abdomen is drawn downwards the pubic hair is displaced on to the front and sides of the swelling. The peduncle of the mass extends from the pubes to the anus, occupying the perinæum. The surface may be smooth and uniform, or show a rough, scaly surface, here and there raised into warty prominences which consist of hypertrophied papillæ, these prominent patches being separated by rugæ, which, when opened up, are moist and superficially ulcerated from retained secretion and intertrigo. In other places collections of rough, thickened, dirty-looking epidermis recall the condition of "ichthyosis." In other cases patches of the skin are occupied by foul ulcers. The discharge of lymph from vesicular prominences—in fact a condition of lymph secretion—sometimes co-exists with elephantiasis. The swelling, when not inflamed, is somewhat insensitive. The inconveniences, from the interference with locomotion and the function of the parts, are obvious. There is scarcely any limit to the size of the swelling (Fig. 81). Thus it may weigh more than 200 lbs. (Larrey, *Chir. Milit.*, t. ii. p. 115). Clot-Bey's* celebrated case weighed 110 lbs. In this case the penis was saved, but the testicles sacrificed. Sloughing of these enormous masses has occasionally been noticed.

Treatment.—I will only allude here to the great importance of prophylactic measures—*e.g.*, the use of boiled water for drinking, avoiding washing in stagnant water, &c. In the very early stages, rest during the attacks of fever, pressure and support as afforded by strapping, or persevering use of india-rubber bandages, may, aided by rest, elevation, and change of climate give great relief, but nothing short of an operation will effect a cure in advanced cases. And this should not be delayed. Not only does the risk of the operation increase in direct proportion to the bulk of the mass, but the patient's strength is pulled down by the recurrent attacks of fever, and visceral degenerations steadily set in. The employment of pressure is, of course, a matter of much greater difficulty in a hot climate than in ours.

Most of the following account of the operative steps for scrotal elephantiasis is taken from Dr. P. McLeod's article (*Dict. of Surg.*, vol. ii.), which is based on very large practical experience gained at Calcutta. The following are, in his opinion, contra-indications to operation : (i) Old age.—Sexual disablement is here not a matter of much consequence, and it often happens that the tumour has by now become stationary in its growth, and the concomitant fever has ceased to occur, or become less frequent and severe. (ii) Ill-health and visceral disease.—A weak or damaged heart, albuminuria, chronic diarrhœa or dysentery, are prohibitive of operation. Cachexia and anæmia are serious objections, and diabetes is absolutely prohibitory. Recent and acute enlargements of the spleen and liver are likewise prohibition, but chronic enlargement of either organ, if not accompanied with manifest impairment of health, is not a bar to removal of elephantiasis by the knife.

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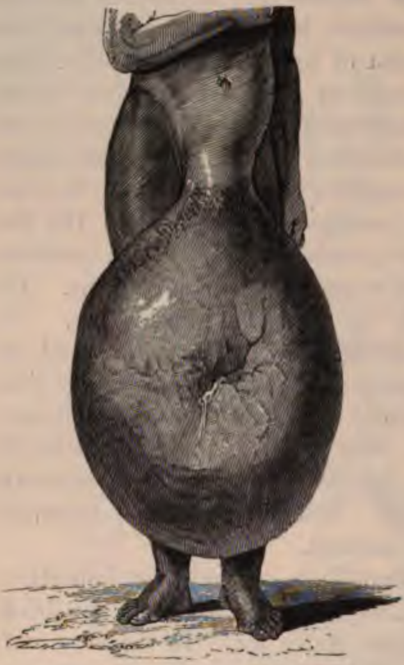
* The extensive experience of this surgeon will be found in his *Histoire d'une tumeur éléphantiaque du Scrotum*, Marseilles, 1830; in the *Ann. de la Méd. Physiol.*, 1834; and in the *Mem. de la Soc. de Chir. de Paris*, t. iv. p. 547.

FIG. 81.



From a case in Dr. Titley's *Diseases of the Genitals of the Male*. (Curling.)

The following complications are given : (i) any abscess should be drained before operation ; if dependent on diseased tunics, it may safely be removed along with the tumour. If any ulceration present be small and due to local irritation or a preceding abscess, the operation need not be delayed. If large, and due to general ill-health or extensive sloughing, caution and delay are advisable. (ii) A stricture should be fully dilated before the operation is resorted to, because there is often difficulty in passing urine for a few days, and the use of a catheter is by no means an easy or a safe matter, unless the urethra is of normal size. Fistulæ should, if possible, be cured by dilatation of the urethra, accompanied, if needful, by free incision ; if they cannot be closed, operation should be declined. (iii) Very large hydroceles and hæmatoceles enhance the risk of the operation, but are not a bar to it. If the patient is very old the propriety of interference is more than doubtful, but in young and middle-aged subjects both diseases can be cured by the same procedure. (iv) The existence of hernia imports a very serious risk, and the simultaneous removal of the tumour and cure of the rupture has been proved to be a very serious practice.* (v) Operation should never be resorted to when the tumour is inflamed, or while any constitutional pyrexia exists. Large size does not constitute so strong an objection to operation as some of the other considerations which have been adduced, for though it is true generally that the danger of removal is directly proportionate to the bulk of the mass, still, under improved methods, the risks depending upon size have been greatly reduced, and immense tumours, weighing, after removal, 100 or 120 lbs., have been successfully removed.

The following are the chief points to pay attention to during the performance of the operation (McLeod):

1. To empty the tumour as completely as possible by elevation and elastic bandages, these being employed for ten to thirty minutes according to the size of the mass.

2. To prevent bleeding during the operation, an elastic cord† should be tightly tied round the root of the tumour before the removal of the bandage, and secured in position by being attached by tapes to a waist-belt. An easier and equally efficient plan is to take an elastic cord about 3 ft. long, pass the centre of it round the loins, bring the ends over the brim of the pelvis, cross them twice over opposite sides of the neck of the tumour, and finally bring these together below the navel; the neck of the tumour will then be tightly embraced by two turns of the cord on each side, crossing each other on the pubes and just in front of the anus. Kocher prefers the use of a clamp devised and used by Dr. Turner of Samoa. He has operated most successfully, only losing two patients out of 138, and neither of these from shock. He states that the clamp, which consists of two parallel wooden bars, approximated by screws, has the following advantages over Esmarch's bandage: (1) The skin at the pedicle of the tumour is not so much folded in. (2) The compression is more easily slackened at will, so that successive ligaturing of the vessels is rendered easier. (3) The

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* The hernia should be kept up during the operation, if possible. If the sac be opened, it should be tied up. This accident happened twice to Sir J. Fayrer (*Clin. and Path. Obs. in India*, pp. 422, 431). The patients recovered.

† Before either cord or clamp are applied any hernia present must be reduced.

clamp holds much more safely, the Esmarch's bandage tending to slip off as soon as the growth is cut away. If any portion of the diseased tissue be left behind, recurrence is almost certain. Even if the prepuce appears to be healthy, it should be removed close to the corona; and as thickening is peculiarly apt to commence in the raphé of the perinæum, that part should in most cases be freely removed by a V-shaped incision up to the verge of the anus. If any attempt is made to cover the penis or testicles with flaps, these should be taken from the skin of the abdomen or thighs, and not from the neck of the tumour; but a satisfactory result can be secured in all cases without resort to flaps, which are prone to slough or suppurate, and initiate septic disturbance.*

3. The first step in the actual operation consists in dissecting out the penis. A dissector is passed under the prepuce, as far as the reflexion of its lining membrane on to the corona, and by means of a bistoury the prepuce is slit open. An incision is then made from the root of the penis along the dorsum to meet this first cut. The penis is then freed by fingers and knife, the mucous membrane of the prepuce being carefully detached at the line of its reflexion. The isolation of the penis is completed as far as its suspensory ligament, which should not be injured. A vertical incision is now made from the pubes to the fundus of the tumour, over one cord and testicle. By successive bold strokes these are exposed and then dissected out, being subsequently held out of the way by an assistant. The other testis is similarly dealt with.† The three vertical incisions are then connected at their pubic terminations by transverse cuts, which must be beyond the limits of the disease. A circular or oval incision is then made round the rest of the circumference of the neck of the tumour, and by rapid strokes the whole mass is removed. Vessels are next looked for. The largest will be found in the centre of the perinæum, and on each side of the pubes. When the cord is gradually loosened others will be observed to spring. All bleeding points should be carefully secured, and as many as thirty to forty ligatures may be required. The parts may now be trimmed if in the hurry of the operation any diseased tissue has been left behind; and if the tunics are redundant or

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* Of course where healthy flaps are easily obtained, they promote rapidity of healing.

† Nowadays, with the advantages of our aids to a bloodless operation, the genitals should very rarely be sacrificed, however large the growth.

thickened, as much of them should be carefully dissected off as can be done without endangering the vitality of the testicles.

4. The testicles may now be stitched together with chromic gut and fastened by the same material, into pockets which can be very easily made for their reception by separating the deep layer of the superficial fascia from the fat and areolar tissue. The skin can then be drawn together over them from each side to a considerable extent, by means of a continuous suture.

5. The prevention of putrefaction in such an extensive wound, situated in such close proximity to the anal and urethral orifices, and to which it is difficult to maintain dressings in close contact, is only to be secured by irrigation, adequate drainage, and the careful application and sufficiently frequent renewal of antiseptic dressings.

As where it has not been advisable to provide flaps, the wound must heal by granulations, the process of repair is tedious, occupying from six to eight weeks. Care must be taken to keep the penis free, as it is apt to become embedded in and retracted into the mass of granulation tissue. Should such a result threaten, the granulations at its root may be broken down by the finger-nail, or divided by scissors, if they have become firmer. The ultimate result of the operation is, in the great majority of cases, satisfactory. By the process of cicatrisation skin is dragged from the thighs to form a seemly and useful substitute for the amputated scrotum, and the penis acquires a fresh covering of cicatricial epidermis. The sexual functions are restored, and health and comfort are established.

In cases where the penis is unaffected, the scrotum may be removed by a similar incision round its neck, the testis being dissected out as the incision is deepened.

LYMPH-SCROTUM.

This condition (Fig. 82), known also as varix-lymphaticus,* is one allied to elephantiasis, and is probably dependent upon the same cause. It is only met with in the tropical climates, or in those who have lived in such climates, especially in China and India. Dr. Manson, of Amoy, gives the following account of the disease ("Med. Rep.," *Customs Gazette*, Shanghai, 1873): The patient, of any age from eighteen to seventy-two, has probably been subject to attacks of malarial fever; usually, he has had several attacks, but sometimes only one. During a paroxysm of the fever, the scrotum and inguinal glands, or perhaps the testicles, become inflamed. Such attacks of fever and inflammation may be repeated several times, and usually during one of these an abscess forms in the scrotum. After one of these attacks, the swelling of the parts having somewhat subsided, vesicles are discovered on the surface of the thick and roughened scrotum; after a time, one of these vesicles bursts spontaneously, or is opened, and a large quantity of straw-coloured, serous-looking fluid escapes. The opening thus made is maintained for several days, and when about 8 to 10 ounces of the fluid have run away, heals. The bulk of the scrotum is much reduced by the discharge; after a very few days, however, the fluid reaccumulates, the vesicles refill, and the affected parts become as big and cumbersome as before. In every case the inguinal glands are enlarged. The fluid is undoubtedly

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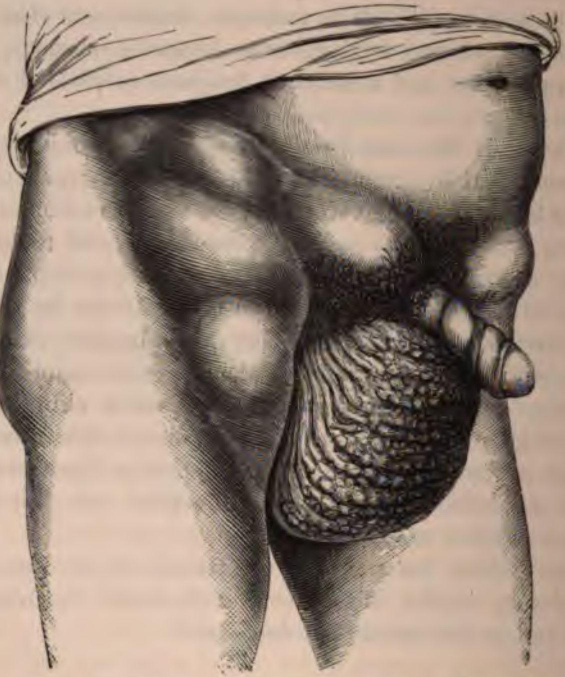
* A less well-chosen name, as we believe that a varicose lymphatic may, by opening on to the urinary tract (kidney or bladder), or, the peritonæal cavity, cause chyluria or chylous ascites.

FIG. 82.



Lymph-scrotum, accompanied with external discharge of lymph and chyluria. Hypertrophied lymphatic glands are seen in each groin. (Carter.)

lymph mingled with chyle. The following interesting account is from Dr. Carter's paper, "Local Affection of the Lymphatic System and Chylous Urine" (*Med.-Chir. Trans.*, vol. xiv. p. 191): An adult Hindoo became an out-patient on account of an affection of the scrotum. The skin of this part was corrugated in a peculiar way, and studded with numerous small tubercles, which were soft, and when punctured, freely discharged a chylous fluid. The inguinal glands on both sides were much enlarged, soft, and doughy to the touch, and they diminished in size under pressure. *History.*—Four months before, the scrotum began to enlarge, and after a time the peculiar corrugation of the skin appeared. The milky discharge had occurred spontaneously, and then intermitted; it had then been going on for two days, and the patient reckoned that he had lost about one pound of fluid daily. It issued from several spots, probably according to the number and position of the tubercles that had burst. When it ceased, and sometimes also during the time that the discharge was going on, the urine became chylous, and frequently coagulated. Such was his own account. Health indifferent. No appetite. When the patient was admitted, it was proved that the swelling of the inguinal glands seemed to alternate with the appearance of chyle in the urine. The parts also swelled two or three hours after a full meal, and then again subsided. The fluid while flowing from the scrotum assumed a very decided rose-tint, and coagulated entirely in eight or ten minutes. Microscopical and other examination showed it to be an admixture of lymph and chyle. Various plans of treatment were adopted, without good result.

With regard to the affinities of this disease, and especially to elephantiasis of the scrotum, Dr. Manson, of Amoy, in a most interesting paper (*Med. Times and Gaz.*, 1875, vol. ii. pp. 542, 566), propounded the general identity of lymph-scrotum with scrotal elephantiasis. That they are similar diseases, or even the same disease in different forms, is made probable by the following facts. They both attack the same part, and they are both accompanied by the same kind of fever and inflammation; they both involve primarily the lymphatics. Lymph-scrotum has been found only in countries where elephantiasis is endemic; the course of both affections is similar, and they may both occur together in the same indvidual, or one after the other. Finally, the belief of Dr. Manson that both these diseases would be explained by the presence of the filaria sanguinis hominis, which brings about an obstruction of the thoracic duct or lymphatics leading into it, and thus a dilatation and varicosity of the lymphatics has been proved to be correct, though we do not yet know exactly how the obstruction is brought about.

Treatment.—The affected parts should be freely excised, with the precautions given at p. 583. Sir J. Fayrer (*Clinical Surgery in India*, p. 352) excised one of these scrotal swellings the size of a cocoanut. The parts healed well by granulation.

CHAPTER V.

SCROTAL FISTULÆ AND SCROTAL CALCULI.

As these affections are not, primarily, diseases of the genital organs, they will be only briefly alluded to here.

Fistulæ.—The following are the chief causes of scrotal fistulæ: Stricture, or other causes of obstruction to the passage of the urine form, of course, the greatest number. Others are, suppuration in connection with epididymo-orchitis, or orchitis due to tubercular mischief. Kocher gives, as a much rarer instance, the burrowing towards the scrotum of fistular tracks, which have started in a suppurating bubo. Finally, and very rarely nowadays, scrotal fistulæ may point to the presence of scrotal calculi.

Scrotal Calculi.—We read occasionally in old works of calculi often large and multiple, which had made their way by ulceration into the scrotum, lodged there, increasing in size, and then either escaped by further ulceration, or had been removed. At the present day the same condition may still occur in districts far removed from surgical aid. Sir G. Humphry (*Syst. of Surg.*, vol. v.) quoted the following cases: Auvert (*Selecta Praxis Medico-Chirurgicæ*, vol. ii. tab. ex. 1) figures and describes an enormous urinary calculus, which apparently began to form when the patient was ten years old, and ulcerated through the scrotum when he was seventy-one. A urinary calculus, weighing 8 oz., in the Norwich collection, is said to have been removed from the scrotum. A shoemaker had, for twenty years, a stone in the scrotum, which he supported on a pad; at length it got to such a bulk, that during straining at stool, it ruptured the scrotum and escaped; it weighed 26 oz.* The following cases show that this affection may still occasionally be met with. Lippman (*Centr.*

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* See also Gräfe, "Ueber Scrotal Steine" (*Gräfe and Walther's Journal*, Bd. iii. S. 399; Crosse *Urinary Calculus*, p. 32).

f. Chir., April 23, 1881) reports the case of a peasant, aged sixty-eight, who stated that fifteen years before, finding great difficulty in micturition, he consulted a medical man, who removed from the scrotum a calculus weighing about 4¼ oz. From this there resulted a urethral fistula, which gave passage to the urine, at first easily, then with increasing difficulty. The fistula was situated a little behind the junction of the penis and scrotum. The scrotum was as large as a fœtal head, and of hard consistence. The testicles were retracted towards the external ring, and extremely atrophied. When a catheter was introduced it was stopped by a calculus. By an incision in the scrotal raphé four calculi, weighing altogether about 1½ oz., were removed. They were facetted, and made up of phosphates. The wound healed well, but left a fistula. A case of Dr. Schkott's, of Moscow, is given in the *British Medical Journal* for July 11, 1885. The patient, aged twenty-seven, had, when a child, some obscure affection of the scrotum. Later on he noticed what he took for a third testicle. For seven years before he had frequently passed blood in his urine, and for two years micturition and coitus had been painful. Three months before admission he struck the scrotum, and an abscess formed and left a fistula. A probe detected three hard substances, which could be moved separately. By incision seven uric-acid calculi were removed from a sac of connective tissue. This was excised and sutured with catgut after the opening into the urethra had been first closed with like sutures. The fistula re-opened, but was closed by a second operation.

PART IV.

DISEASES OF THE VESICULÆ SEMINALES.

CHAPTER I.

ANOMALIES. ATROPHY.

THOUGH diseases here, compared with those of the rest of the male sexual organs, are not common, they deserve more attention than they have received. Mr. Jordan Lloyd (*Lancet*, 1891, vol. ii. p. 974) thinks that affections of these bodies are much more frequent than is usually believed, and that cases that are really disease of the vesiculæ (*e.g.*, vesicular, or peri-vesicular, inflammatory, indurations), are erroneously regarded as swollen prostates.

Anomalies.—Instances of abnormalities in development of the seminal vesicles have already been given, pp. 24–27. There appears to be a connection between the functions of these bodies and their anomalies; just as they have two functions, one to act as ampullary dilatations of the vasa deferentia, and so to serve as storehouses of the seminal fluid; the other, an independent function, to add a fluid which shall affect the bulk and density of the ejaculated semen, in the same way their development may fail in a twofold manner. In one set of cases—showing their dependence on the rest of the genital tract—they may be absent when the excretory apparatus, especially the terminal or urethral part of it, is ill-developed. In another, showing how the vesiculæ seminales are independent of the vasa deferentia, there may be bilateral absence of the testicle, epididymis, and the extra-abdominal part of the vas deferens, while the vesiculæ seminales and the deeper parts of the vasa deferentia may be present and well developed.

The chief point to remember is that the condition of the vesiculæ seminales shows no especial relation to that of the testis. One testicle may be wanting or imperfectly developed; one vas deferens may be only partially formed, or may be obliterated;

yet the vesicula seminalis on that side is usually as large as its fellow. In such cases it is filled with its own secretion, unmixed with spermatozoa. This corresponds with the well-known fact that ejaculatory power may be present in those whose testes are imperfect or absent.

Atrophy.—This may be the result of the natural changes of old age, or follow on previous inflammation. Atrophy does not appear to be so constant after castration as would be expected, but in judging of this the age of the patient at the time of the operation must always be taken into account.

CHAPTER II.

INFLAMMATORY AFFECTIONS.

THESE may be **acute** or **chronic**. As the symptoms are much the same, varying only in degree, and as the causes of the two are the same, they will be considered together. Mr. Jordan Lloyd, in an interesting paper on "Spermato-Cystitis, or Inflammation of the Seminal Vesicles" (*Lancet*, 1891, vol. ii. p. 975), gives the three following varieties: *acute*, *sub-acute*, and *chronic*. The first usually complicates true gonorrhœa, the second occurs in the non-specific variety of urethritis—in another paper (*Brit. Med. Journ.*, 1889, vol. i. p. 882), urethritis after the passage of a bougie, or set up by the presence of a stricture, or occurring after coitus with a leucorrhœal woman, are given as instances—and the third is a sequel of the other two. From the situation of the seminal vesicles, inflammation can reach them from the urethra (especially the prostatic part), the bladder, prostate, and epididymis.

Thus, amongst the most frequent **causes** are gonorrhœa, stricture, old gleets again lit up into activity, cystitis, peri-cystitis, hypertrophy of the prostate, and in some cases, perhaps, displacement or occlusion of one ejaculatory duct. By far the most common cause of inflammation of the vesiculæ seminales is gonorrhœa. Mr. Jordan Lloyd (*loc. supra cit.*) believes that as a complication of gonorrhœa this condition is as common as, indeed more so, probably, than gonorrhœal epididymitis. He holds that "an inflammation which has once reached the ejaculatory duct is much more likely to extend along the half-inch duct into the vesicles than along the sixteen-inch passage to the epididymis, and that it does so any one can determine for himself if he will examine per rectum all gonorrhœal patients who complain of increased frequency of micturition." He further believes that the symptoms of inflammation of the vesiculæ seminales are attributed to other maladies altogether—*e.g.*, prostatitis, inflamtion of the neck of the bladder, or reflex spasms from an inflamed urethra. The same writer draws a parallel between inflammation of the vesiculæ seminales and epididymitis. Both are nearly always secondary to urethral inflammation. Both are common in the third or fourth week of a gonorrhœa. In both the inflammatory process affects chiefly the connective tissue between the tubular structures, giving rise to the well-known ovoidal mass in the one case, and the swelling felt through the anterior wall of the rectum, mistaken for the acutely inflamed prostate, in the other. In both cases suppuration is the exception, resolution the rule. Kocher considers that another source of thickening of the fibrous tissue of the prostate, and also of the vesiculæ seminales, is present in thrombosis of the prostatic and vesical plexuses, with formation of phlebolithes, &c., it being well known that venous thromboses elsewhere are productive of hypertrophy of fibrous tissue.

In a few cases suppuration of the seminal vesicles takes place without any antecedent urethritis. The following case of Mr. Jordan Lloyd's is an instance, and is especially interesting owing to the method adopted for getting at the pus. The patient was aged thirty, healthy, married, and the father of three children, and his wife was again pregnant; he had never had any venereal disease. Pain in the rectum, coming on without any known cause, had been felt twelve days previously. For the previous forty-eight hours there had been difficulty with his water, frequent desire to micturate, and pain at the neck of the bladder. This had been diagnosed as due to acute prostatic abscess. There was a cloud of mucus in healthy urine. The patient had no orchitis. Per rectum, Mr. Lloyd found "on the right side a deep-seated, smooth, round, fluctuating swelling, with its longest diameter in the direction of the bowel, and its lower end about one inch and a half from the anal margin. Pressure on this was painful, and gave rise to a desire to micturate. Under chloroform I made a puncture through the perinæum, inserting a long-bladed knife, about one inch to the right and in front of the anus, and guided by the finger in the rectum, entered the blade to the depth of two inches, tapping a cavity containing about four drachms of pus. A finger passed through the wound entered a cavity which lay altogether to the right of the middle line up to the side of the pelvis. The cavity was drained, and all symptoms at once disappeared. The wound healed up completely in eight or nine days, and for three or four days he seemed to be perfectly well. He then developed a train of symptoms precisely like those of his former illness, and I was asked to see him again. I then found an elongated, fluctuating swelling on the left side of the base of the bladder, the right side being perfectly normal." This was opened and drained in a similar manner to the first, and in two or three weeks had soundly healed. A finger exploring this cavity found it close to the base of the bladder, and extending upwards, so that the finger-tip could almost be felt from the left groin above.

Symptoms.—These are much the same as in acute and chronic prostatitis. Thus, we have pain, varying in severity, referred to the bottom of the belly, the perinæum, groins, hips, sacrum, and lumbar region. It may be very acute and lancinating, or of a burning or pricking character. It is usually increased by defæcation, or micturition, and the latter act is not only painful but frequent, and complicated with tenesmus or retention. Blood or pus may escape from the urethra during or independently of micturition. A characteristic but by no means constant symptom is that of frequent and painful emissions, blood-stained, or mingled with pus. According to Zeissl, there is one symptom which belongs exclusively to inflammation of the seminal vesicles—namely, erections which are almost constant, and so painful as to constitute priapism. Rare but interesting evidence of inflammation of the seminal vesicles may show itself in epididymitis, the mischief having travelled along the vas deferens. In a case of Kocher's, of which the origin was quite obscure, œdema, and redness of the skin superficial to one posterior-inferior spinous process, pointed to inflammatory œdema of the pelvic connective tissue making its way externally through the great sciatic notch. In other cases the inflammation makes its way along the connective tissue of the cord.

Examination per rectum often gives valuable information. Two elongated swellings, situated beyond the prostate, running obliquely upwards and outwards at the base of the bladder, hard, elastic, or fluctuating, according to the stage, and sometimes exquisitely tender, can be detected. Guelliot points out that enlargement of the seminal vesicles can be more easily made out when the bladder is full. Mr. Jordan Lloyd (*loc. supra cit.*) has found that the swelling may be made evident to the examining finger when a sound is passed into the bladder, and moved from side to side across the swelling. The following are possible **sequelæ**:

(1) When the inflammation is acute and has run on into suppuration, most troublesome **abscesses** may form, and burrow between the rectum and bladder, finally leaving very tedious fistulous tracts. (2) As the upper ends of the vesiculæ seminales are covered by peritonæum, **peritonitis** may follow; several cases of this complication ending fatally have been recorded by French writers. The following case is recorded by Mr. Mitchell Henry *Med.-Chir. Trans.*, vol. xxxiii. p. 307): A sailor, aged twenty, was admitted into the Middlesex Hospital for pain in the loins and hip-joint, and moving like a patient with hip disease. Examination showed that there was no active disease of this joint. The patient, a person of dull intellect, could give but little account of the origin of his complaint, further than that being generally in the enjoyment of good health, he attributed his present symptoms to a severe wetting to which he had been exposed three months before. He had never suffered from gonorrhœa, or syphilis, and had usually no difficulty in micturition. The chief symptoms, great tenderness and shooting pain in the left groin and hip, extending up to the loin of the same side, and much increased by any movement of the joint, were at first relieved by treatment. They soon, however, returned; the urine, at first loaded with pus, afterwards contained blood, and symptoms of acute peritonitis supervened, ending fatally. At the necropsy the abdominal cavity contained a great quantity of creamy pus, evidently from an abscess and not the produce of peritonitis. The peritonæum was in an early stage of inflammation. The bladder contained some purulent fluid, and was perforated by an ulcer as large as a sixpence. The bones of the pelvis, the lumbar vertebræ and the left hip-joint, where there had been so much pain, were found healthy, and the same was the case with the urethra, prostate, neck of the bladder, and testicles. At length, however, the remains of a large abscess were discovered in the site of the left vesicula seminalis, which was nearly destroyed by suppuration. The abscess had perforated the bladder, and as the perforation had taken place just where the peritonæum is reflected from the sides of the bladder, the pus had found its way into the abdominal cavity, setting up fatal peritonitis.

Another case of a similar kind under Velpeau's care (*Med.-Chir. Rev.*, 1857, vol. i. p. 270), in which the diagnosis was obscure, may be referred to. A young man with gonorrhœa died of peritonitis: at the necropsy, the seminal vesicles were in a state of suppuration, and the peritonitis had originated at the recto-vesical cul-de-sac. As long ago as 1850 Velpeau had taught that gonorrhœal inflammation of the seminal vesicles is far from rare. A case of his in which gonorrhœal epididymitis, followed by inflammation of the vesiculæ seminales and fatal peritonitis, will be found recorded by M. Peter (*L'Un. Méd.*, 1836, t. x. p. 562). The patient was aged sixteen, and symptoms of peritonitis appeared between three and four weeks after the commencement of the gonorrhœa. At the necropsy a litre of pus was found in the pelvis, and general peritonitis. The left vesicle contained pus, and the inflammation had reached the peritonæum by spreading through the tissues surrounding the vesicle.

A third case, probably similar to Mr. Henry's, in which the diagnosis was also obscure, in which disease of the hip-joint was closely simulated, and in which a similarly fatal result was probably prevented by the timely evacuation of the pus, was communicated to Mr. Henry by Mr. Cock. The patient was about thirty-five; he had lived a fast life, and was ill-conditioned and cachectic. Some weeks before he was seen by Mr. Cock he had begun to complain of deep-seated pain and uneasiness in the lower belly, extending round to the hip-joint. This was increased by exercise, and by a frequently distended state of the intestine, for the patient was dyspeptic and flatulent. Hip-joint disease had been diagnosed, but was decided against by Mr. Cock. There was pain and tenderness on pressure over the pubes and towards the left iliac fossa, and when the abdomen was empty and flaccid a slight fulness could be perceived. The patient was tolerably free from pain when lying still, but could not bear any movement. Mr. Cock could not make any satisfactory diagnosis. The functions of the bladder and lower bowel were normal. Nothing material could be felt per rectum. In three weeks all the symptoms, both local and constitutional, had increased. There was now great febrile excitement, pain extending up the left loin to the kidney, some incontinence of urine, and lastly tenesmus and pain in the evacuation of the bowels. As far as Mr. Cock recollected, the patient had only one rigor. Per rectum the finger now felt a fulness encroaching on the bowel and to the left of the prostate, corresponding to the site of the left vesicula seminalis, with an obscure sense of fluctuation when pressure was made over the pubes. In two days' time the fulness and fluctuation was more distinct, and the swelling was opened with a guarded bistoury.

A quantity of thin, dark, offensive pus was immediately discharged, and continued to come away for several weeks, the patient finally getting quite well. There was no clue as to the original cause or site of the abscess; Mr. Cock had an idea that it was caused by some foreign body, as a fish-bone, perforating the bowel, but nothing of the kind came to light. (3) Another very grave complication is **pyæmia**, readily explained by septic phlebitis of the adjacent venous plexuses, which lead to infarcts in the lungs, kidneys, &c. (4, 5, 6) From the difficulty in getting any local treatment to act upon parts so deeply situated, and from the close connections which the vesiculæ have with the lower part of the rectum, base and neck of the bladder and prostate, it is readily intelligible how very obstinate and tedious a gleety discharge, kept up by chronic inflammation and an **atonic condition of these organs** may be, and also how easily **irritability of the neck of the bladder** and of the **sexual organs** may be set up. (7) It is possible that by the mischief travelling from one vesicle downwards an **epididymitis** may be produced. (8) In the majority of cases resolution follows. (9) The **cystic swellings of the vesiculæ seminales**, described below (p. 600), probably originate, in some cases, in inflammation of these bodies.

Treatment.—I shall first speak of *acute* and then of *chronic* inflammation. (A) *Acute inflammation of the vesiculæ seminales.*—This will run on the same lines as that for acute prostatitis. The bowels should be thoroughly cleared out by an efficient purge, and then kept relaxed by saline aperients, sulphur, &c.; the patient must rest absolutely in bed, and his diet must be carefully restricted, unstimulating, and limited, as far as possible, to food which will furnish very little waste matter—*e.g.*, milk, strong soups, &c. In robust patients, during the early and painful stage, a mixture of antimony, as prescribed at p. 274, or one of antimony and citrate of potash, may be given every four or six hours. Later on, quinine or other tonics, especially when combined with liq. hyd. perchlor., may be indicated. Pain must be relieved by morphia administered subcutaneously, or in suppositories, with or without belladonna, or chloral may be found preferable.

The local treatment is quite as important. Hot hip-baths (102°, raised to 108° in a few minutes), in which the patient sits frequently for eight or ten minutes, are of great value, the object being to draw the blood from the pelvic viscera into the skin. In the intervals very hot fomentations of boracic acid to the perinæum may be employed. Extract of belladonna mixed with equal parts of glycerine may be smeared over the perinæum, but I have very little faith in this step without the use of moist heat. Leeches are of great service if used early. Eight to a dozen should be applied to the perinæum close to the anus, and their bleeding should be encouraged by heat applied after the leeches have fallen off. If from extension of the mischief retention of the urine occur, some form of soft catheter—*e.g.*, Jacques', a double-silk-web, or a coudée or olivary, should be preferred; these failing, the bladder should be aspirated above the pubes. Where, from the acuteness of the case, the severity of the symptoms, rigors, &c., suppuration is suspected, the pus must be let out as soon as possible, owing to the gravity of the complications (peritonitis, pyæmia, burrowing of the pus, and formation of fistulous tracks) which now may follow. There are two methods of evacuating the matter: one through the bowel, and the other from the perinæum. The first is advocated by Kocher as less likely to injure important parts, and as giving better drainage. It is easily done with a duck-bill speculum; nowadays, a small electric lamp would enable the surgeon to see exactly what he is about. The incision by the perinæum has been advised by Mr. Jordan Lloyd (*loc. supra cit.*), and I should certainly agree with him, for in opening prostatic abscesses per rectum, I have been struck with the difficulty of retaining a drainage tube and of preventing the wound from becoming septic.* The method of making the perinæal incision will be gathered from Mr. Jordan Lloyd's case (*supra*, p. 594).

(B) The treatment of *the more chronic form of inflammation of the vesiculæ seminales* is similar to that for chronic prostatitis.—The chief points will be avoidance of all possible sources of congestion, especially sexual excitement, daily relief of the bowels, and a nourishing but simple and easily assimilated diet; if any alcohol is needed claret, hock, or one of the lighter Australian wines is to be preferred. Liq. hyd. perchlor., with tonics, will probably be useful, and sea-side air and bathing very beneficial. Locally, douching the perinæum with hot and cold water, alternately, by means of a bidet, and then vigorous friction, will be more useful than blistering, the use of iodine, or silver nitrate.

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* Kocher believes that this can be prevented by using injections and iodoform suppositories. The difficulty of retaining a drainage tube, if introduced by an incision through the bowel, is not alluded to by him. I have found that it readily slips out, even when a needless length of it is coiled up in the abscess sac.

CHAPTER III.

DILATATION AND CYSTS OF THE SEMINAL VESICLES.

THE above changes are usually associated with chronic inflammation of these organs. Dilatation of the seminal vesicles may occur with atrophy; in other cases it follows on obliteration of the ejaculatory or excretory duct, the results usually of inflammatory changes. The result of the dilatation will be, in some cases, a monolocular cyst, the single cavity consisting either of the whole vesicle dilated or of a single diverticulum expanded; in other cases, according to Guelliot, the cystic dilatation is produced by expansion of many of the diverticula, from obliteration of their openings into the central cavities. Here the vesiculæ show a great number of small, round, transparent swellings with viscid, yellowish discharge. Thus there are two chief varieties of dilatation of the seminal vesicles: that in which there is a conglomeration of cysts, and the other where there is a single cyst. While the latter are of the chief clinical interest, owing to the large cystic swellings which may thus arise, it is possible that the former may also be of importance by producing symptoms of irritation of the bladder, the same as we saw might be produced by chronic enlargement of the vesiculæ, and analogous to those due to enlarged prostate. The following is an instance of cystic degeneration of the vesiculæ, there being a collection of several cysts: Dr. Heinemann (*New York Med. Rec.*, March 6, 1880) showed, at the New York Pathological Society, a specimen in which the vesicles were the seat of cystic degeneration.* They measured two inches in length, one and a quarter in breadth, and three quarters of an inch in thickness. They contained a brownish mucoid fluid which could, by slight pressure, be forced through the ejaculatory ducts, and which contained well-developed spermatozoa. No history bearing upon this condition had been obtained during life. Very few similar cases have been recorded, perhaps because these organs are not regularly examined. Englisch (*Wien. Med. Jahrb.*, 1874) has described four different kinds of cysts which may be met with on the posterior wall of the bladder. (1) Found as a single cyst in the middle line of the posterior wall of the bladder, low down. (2) Connected with either vas deferens. (3) Situated in the prostate, being really only a dilated sinus pocularis. (4) Cystic degeneration of the seminal vesicles. The first three varieties might be congenital, dating to fœtal remains—*e.g.*, of Müller's duct; the second and third were unilateral. The fourth usually dated to old inflammation, and was generally bilateral.

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* Kocher describes a similar multilocular case which is in the Göttingen Museum. There is nothing abnormal in the mouth of the ejaculatory duct; the prostate is somewhat enlarged, and there are several deep ulcers on the mucous membrane of the bladder.

The following are instances of large cystic swellings arising probably in dilatation of the seminal vesicles. Dr. Ralfe (*Lancet*, 1876, vol. ii. p. 782) reports the case of a man, aged twenty-eight, who was admitted into the Seamen's Hospital, Greenwich, for enlargement of the lower part of the abdomen. The family and personal history were good. Patient was married; and had one child. The left testicle had never descended. The present illness began four months before admission, with pain in the hpyogastrium, and then the presence of a small swelling in the middle line just above the pubes. There was difficulty in passing urine, and a catheter was employed on several occasions; the difficulty passed off, and never recurred. The swelling increased slowly at first, but more rapidly during the ten days before admission. On admission there was obstinate constipation; the urine was passed naturally, and not too frequently. The left testicle was in the canal. There was a swelling extending from the pelvis to the umbilicus, reaching laterally 3½ inches on each side of the middle line; it was smooth, rounded, and immovable, feeling quite solid, and was very painful and tender. The constipation persisted, vomiting set in; the abdomen became tense and tympanitic; there was intense pain, the patient emaciated, and died about five weeks after his admission. At the necropsy the peritonæum showed many firm adhesions. A large swelling occupied the middle line, extending from the pelvis to a little above the umbilicus, and, laterally, into the iliac fossa to a slight degree. The walls, about ¼ inch thick, gave way in many places during its removal. It was unilocular, contained a quantity of blood and serum, and a layer of soft fibrin was adherent to its inner surface. The bladder was small and flattened; it lay in front of the lower part of the swelling, behind the pubes; its walls were quite healthy. The rectum was healthy and compressed against the pelvic walls. The vasa deferentia coursed along the front part of the swelling on each side, curving backwards and downwards over its upper end to the seminal vesicles. Of these, the left was large, nodular, and closely connected with the swelling at its posterior and inferior part. The right seminal vesicle was unaffected. The swelling lay behind the prostate, between the bladder in front and the rectum and the seminal vesicles behind. The pelvic and lumbar glands were healthy. It would be interesting to know what an examination per rectum would have revealed in this instructive case.

Under the title "Hydrocele of the Seminal Vesicle," Dr. N. R. Smith, of Baltimore, related the following case (*Lancet*, 1872, vol. ii. p. 558). Being called, in consultation, to a case of retention of urine, he found a large pyriform swelling occupying the cavity of the pelvis, extending upwards higher than the umbilicus. On percussion it was dull, and gave the vibration of fluid. The patient was passing every hour half an ounce of perfectly normal urine. Only an ounce of this fluid came away when a catheter was passed into the bladder. The catheter could be felt in close contact with the abdominal walls, being pressed forwards by the swelling. An examination, per rectum, showed the prostate to be normal, but when the finger was carried further to the left an elastic swelling, giving the sensation of a cyst, distended with fluid, was at once encountered. Palpation with the other hand on the abdomen made manifest the vibratory movements of fluid. The swelling was tapped with a straight trocar, per rectum, and ten pints of brown serous fluid drawn off. No unpleasant symptoms followed, but in about four weeks the cyst filled and was tapped again. After this there was no recurrence.

CHAPTER IV.

CONCRETIONS IN THE VESICULÆ SEMINALES.

THIS is not a matter of mere pathological interest, as it has been shown at p. 494 that some of these bodies, by interfering with the ejaculation of the seminal fluid, may produce that variety of sterility known as organic aspermia (p. 493). These bodies may be soft and consist almost entirely of spermatozoa, mucus and epithelium being also present. They have been named by French writers, *e.g.*, Reliquet (*Gaz. des Hôp.*, 1860), sympexions. In each of the three cases of this surgeon, only one duct was involved, and he attributed the loss of power of ejaculation to the compression exerted on the pervious duct by the distended one, and to the arrest of the contraction of the former through the pain experienced at the commencement of the expulsive act. In one case the finger in the bowel discovered a bossy enlargement of the right vesicle, and in another, a small swelling due to retained semen was found in the position of the ducts. Reliquet related to the Academy of Medicine of Paris, March 14, 1874, the case of a man, aged thirty-five, who had for some time suffered from painful spasms in the region of the bladder, and from severe pain during defæcation and coitus. No calculus could be found in the bladder. After the removal of a lithotrite used in the examination, the patient had an attack of spasm, passed urine, and discharged with it some small white masses. These consisted of an enormous number of encapsuled spermatozoa. The left vesicula seminalis was found to be hard and swollen, and the contact of the finger produced severe pain and spasmodic contraction. The expulsion of the masses gave great relief.

When the concretions have been present for some time, they become, by the addition of pigment, brownish-black or brownish-yellow, instead of being white or fawn-coloured. By the deposit of salts—chiefly phosphates and carbonate of lime—they undergo calcification, and the evidence of spermatozoa may now be scanty or absent altogether. Beckmann's case (Virchow, *Arch.*, Bd. xv. S. 540) is interesting on this point. In an old man a concretion as large as a cherry was found in a dilated ejaculatory duct, near its orifice. Its surface was irregular, and its interior showed crumbling layers of various shades of yellow. These consisted chiefly of phosphate and carbonate of lime, and microscopical examination showed numerous heads and tails of spermatozoa.

The concretions are generally multiple; the softer ones may be met with at any period of active sexual life, the harder specimens have usually been found in patients past middle life, or in those whose sexual function has for some time been in abeyance owing to disease.

The **causes of the formation of these bodies** are but little known. The softer ones may arise in over viscidity of the seminal fluid. Thus, Beigel (*Krankh. d. Weibl. Geschl.*, Bd. ii. S. 791) relates a case of sterility in which the genitals were normal, but on which repeated examination of the ejaculated fluid showed that it was thicker and more viscid than usual, and that the spermatozoa were motionless. The addition of a few drops of tepid water put them in lively motion, so that the injection of a small amount of lukewarm water into the vagina, after coitus, was advised, and the wife bore subsequently several children.

In other cases there is probably some obstruction to the duct, from changes in the prostate, of cicatricial origin, or due to new growths. Of the latter Kocher gives an instance, both the ejaculatory ducts being obstructed by brownish-black concretions in an adeno-carcinoma of the prostate. In a case of De Blégny's the ducts were occluded with small, hard concretions as large as peas, the veru montanum was indurated, and of the size of a small nut. In many cases inspissation of mucus and subsequent deposit of salts plays the chief part in the formation of these concretions, as in those formed in the prostate.

The chief **symptoms** are seminal colic, sexual irritation felt deep in the perinæum, asthenia, pain during and after coitus, painful micturition, and perhaps tenesmus. Such evidence should always lead to an examination per rectum.

As to **treatment**, possibly after the passage of a sound the softer concretions might be broken up against this with the finger; harder ones might perhaps be dislodged by manipulation, as sometimes happens with salivary calculi.

CHAPTER V.

TUBERCULAR DISEASE OF THE VESICULÆ SEMINALES.

THIS subject has already been alluded ito (p. 340) in the account of tubercular disease of the epididymis and testis. As a primary affection, tuberculosis of the seminal vesicles is extremely rare, and still more rarely diagnosed. As a secondary affection this disease occurs in combination with tuberculosis of the lungs, but more frequently after tubercular disease of the epididymis and testis, either by direct extension along the vas deferens, or from extension of adjacent foci caseating in the prostate. A third class of cases includes those in which the disease of the vesiculæ is secondary to that of the bladder, a not uncommon sequence of events being mischief first located in one kidney, then descending along the ureter to the trigone, and so invading the vesiculæ seminales.

The tubercular deposit, whether primary or secondary, begins in the mucous and sub-mucous coats before it caseates, and often the vesicles may be made out by a finger in the bowel to be nodular and bossy. Later on, when softening is taking place, the feeling of bossiness has given place to one resembling tallow or putty. Later still the organs form single sacs distended with pus, which may burrow and form fistulous tracks (p. 596). Whether tuberculosis once started in the vesiculæ seminales can undergo atrophy and be practically cured is, I think, more than doubtful. MM. Guelliot and Broca seem to believe in the possibility of this; judging from the facts, taught us by tuberculosis of the epididymis and testis, I should have thought it more correct to say that though the mischief might, for a while, be quiescent, it did not become obsolete (p. 359).

The following case, which is given by Prof. Kocher, is instructive from many points of view. It is a good instance of tubercular disease of the vesiculæ seminales following tuberculosis of the epididymis and testicle, with, later on, disseminated miliary tubercle. It also illustrates a point on which I have laid stress (p. 364), that these cases of tuberculosis of the genital tract are never the better, but may be made much worse, by a stay in hospital wards. J. K., aged seventy-seven, noticed in the summer of 1883 a swelling of the right testicle, which increased slowly and caused no inconvenience. At the end of 1885 the swelling began to increase quickly, but without pain. The general health at this time was good. There was no history of injury or venereal disease, and the family history was satisfactory. The right testicle was now enlarged, and fused with the epididymis. Below, the skin was infiltrated and adherent to the lower end of the swelling; above, the spermatic cord was much thickened. The prostate was enlarged, and both lobes contained nodules. The patient had no fever on admission, but about a fortnight later he had always a high temperature in the evening, and an abscess broke on the right side of the scrotum. A fortnight afterwards castration was performed. The wound did not heal kindly, the pyrexia continued, and a month after the castration the right seminal vesicle was converted into a mass the size of a fist, with an uneven surface, and extending to the pelvic wall; it was sensitive on firm pressure. The patient emaciated, and death took place eleven weeks after admission, or about seven after the castration. At the necropsy the castration wound was granulating. There were numerous points of miliary tubercle in the liver and kidneys. There were a few ulcers in the lower end of the ileum. The mesenteric and retro-peritonæal glands were much enlarged and tuberculous. The bladder was healthy, but pus flowed out freely from numerous small openings near the caput gallinaginis, and this came from the right seminal vesicle, which was converted into a collection of small abscesses. The globus major of the right epididymis and the body of the right testis contained abscesses. Numerous tubercle bacilli were found.

Treatment.—Mention must be made here of a bold attempt by Ullmann of Vienna to extirpate tuberculous seminal vesicles. The following case is recorded (*Centr. f. Chir.*, Bd. viii., 1890): A lad, aged seventeen, was admitted with tuberculosis of the right testicle; the corresponding seminal vesicle was much enlarged. The left side was normal. The lungs appeared healthy. July 17, 1889, castration was performed on the right side. July 27, the right vesicle was removed by a semilunar incision in the perinæum, midway between the scrotum and anus, the convexity being directed backwards. A careful dissection of the tissues was made, and the prostate reached. The rectum was dissected from this organ, and the posterior wall of the bladder made to protrude slightly by means of a sound; by this means the vasa deferentia and the seminal vesicles could be distinctly seen. The right vesicle was much enlarged, infiltrated, and cheesy; the vas deferens on that side was also affected. The left vesicle was also enlarged and hardened. The vesicles and right vas were carefully removed, but not the left vas. In the right upper corner of the prostate a small abscess was found, and this part of the gland was removed. Hæmorrhage being arrested, a drainage tube was introduced and the wound closed by sutures. That evening severe secondary hæmorrhage followed, which required reopening of the wound, and packing this with iodoform gauze. Some urine escaped through the wound, showing that the bladder had been opened. The patient recovered quickly and regained flesh and strength. A small fistulous opening remained, but all the urine was passed by the urethra. Microscopical examination of the parts removed showed abundant tubercle bacilli. The after-history of this case will be of much interest. Owing to the fact that tubercular disease of the seminal vesicles is nearly always secondary to disease elsewhere, that it occurs late, and that thus time has been allowed for invasion of other organs, it does not appear to me likely that this operation is one that will often be repeated with advantage.

CHAPTER VI.

NEW GROWTHS OF THE VESICULÆ SEMINALES.

In the great majority of cases these organs, when the subject of malignant disease, are invaded secondarily, the disease reaching them most commonly from the prostate, less often from the bladder and more rarely from the rectum, and very occasionally along the vas deferens from the testes.

M. Guelliot quotes a case of Méricamp's in which he believes the disease to have been primary. The left vesicula seminalis was the site of complete carcinomatous degeneration, nodular, hard, and without any distinct cavity. There were nodules in the lung, and the liver and peritonæum were also the seat of carcinoma. The bladder, prostate, and right vesicle were healthy. This case seems to me a doubtful one, as a large mass in the omentum may have been the primary trouble.

Zahn has recorded a case which he believes to have been a primary sarcoma of one vesicula seminalis. I have quoted it from Prof. Kocher's book.

The patient, aged seventy-six, had noticed, a little time before admission, discharge of urine by drops. At the necropsy nodules of growth, believed to be secondary, were found in the wall of the heart, mesentery, and small intestine. The prostate was healthy. Both vesiculæ seminales were enlarged, especially the right. Sections of this showed sarcoma cells of both round and spindle-shape. The surrounding plexus of veins contained fine fibrinous thrombi in which spindle cells could be detected. Zahn considered the cardiac nodules as secondary because they were multiple: as the liver was not affected, he looked upon the masses in the mesentery and small intestine as also secondary. He thought the seminal vesicles were the primary seat of the disease, on account of the nature of the thrombi in the adjacent veins.

PART V.

DISEASES OF THE PENIS.

DIVISION I.

ABNORMALITIES IN DEVELOPMENT.

CHAPTER I.

ABSENCE. APPARENT ABSENCE.

WHILE it is not uncommon to meet with instances of rudimentary development of the penis, as in cases where the infantile type of the genitals persists, entire absence of the penis is almost unknown. It might be expected that other deficiencies in development would actually exist incompatible with life, much as was the case in M. Révolat's case. The following interesting case of Goschler's (*Vierteljahrsch. f. pract. Heilk.*, Prague, 1857, Bd. iii. S. 89) was met with in an adult of twenty-seven. The patient was tall, strong, and well developed in every respect save his genitals, with abundant fair hair on the chin and supra-pubic region; the scrotum was well formed, with a median raphé. The right testicle and cord were normal; on the left side there was an acute "orchitis." A careful search failed to find the least trace of a penis. On the anterior wall of the rectum, and about four lines above the anus, in the middle line, was a rounded orifice which gave vent to the urine. Starting from just in front of the anal orifice was a fold of skin, 1½ inch long and ¾ inch high, continuous with the raphé, in shape like a cock's comb, and with a warty appendage in front. This fold probably consisted of erectile tissue, as it swelled up under sexual excitement. This lasted for several minutes, and usually ended in an emission through the rectum. It was possible to pass a sound from the opening in the rectum into the bladder, along a urethra 1½ inch long. The patient had control over his bladder, passing his urine every three or five hours.

In the case of a new-born child published by Révolat (*Journ. de Sédillot*, t. xxvii. p. 370) there were no external genitals; a spina bifida and an umbilical hernia were present, and below the latter was a transverse opening through which meconium and urine were passed. A third case is one published by Nélaton (*Gaz. des Hôp.*, 1854, No. 12). The patient was a child aged two. The penis was entirely wanting, and both testicles were in the scrotum. The urine was voided per rectum.

My old friend, G. A. Wright, of Manchester (Ashby and Wright, *Dis. of Children*, p. 531), records a case of complete absence of the penis, the urethra opening just at the margin of the anus, outside the external sphincter; the scrotum and testes were well developed.

Mr. Collier relates a similar case (*Brit. Med. Journ.*, 1889, vol. i. p. 409). The child was three weeks old, extremely feeble and emaciated, and died two weeks later. At the necropsy the following particulars were made out. The scrotum was natural, and contained well-formed testicles. There was no trace of a penis, neither corpora cavernosa nor corpus spongiosum being present. There was a congenital inguinal hernia on each side. The anus and perinæum were normal. On everting the anal margin it could be seen that the urethra opened on the anterior wall of the bowel about ½ inch from the anus.

Judging from Goschler's case, it would be well if ever a similar case is met with to remove the testes in infancy.

Demarquay related (*Mal. Chir. du Pénis*, p. 539) an instructive case met with by Bouteiller of Rouen, in which the absence of the penis was apparent only. After careful examination this surgeon thought he could feel beneath the skin a small mobile body which he took for the penis. Having made a T-shaped incision at this spot, he succeeded in freeing a rudimentary penis, out of which the infant passed water for the first time since its birth.

Dr. J. Murphy has recorded (*Brit. Med. Journ.*, 1885, vol. ii. p. 62) a case, which seems to have been of a similar nature, in an infant. Although the scrotum was well formed, there was apparently no penis, and the child passed its urine through an opening in the lower part of the abdomen, in the place where the penis ought to have been. On seizing the skin on each side of the opening, and making pressure downwards and backwards, a small swelling, apparently the glans and penis, covered over, could be distinguished. Incisions having been made above and below this opening, the end of a penis was exposed, the glans being normal, but the body very small indeed. Treatment consisted in pressing out the glans daily; the wounds healed, and after a time the penis protruded and receded of its own accord. It is stated that the organ "will doubtless be equal to any requirements that may hereafter be demanded of it."

CHAPTER II.

TORSION OF THE PENIS.

THIS rare abnormality usually complicates epispadias or hypospadias; by itself it is almost unknown. Mr. Gay reported (*Trans. Path. Soc.*, vol. xvi. p. 189) a case in a child aged eight months. The penis, which was epispadiac, had undergone torsion on its axis, so that its under surface looked upwards and to the left, and the child passed his urine towards or even over the left shoulder. The ample prepuce hung in a fold from the penis, which looked as if, during fœtal life, it had passed through the side of the prepuce, about a third of an inch behind its orifice, which had been preternaturally closed; the crura of the penis could not be traced. In a similar case (Follin, *L'Un. Méd.*, Sept. 30, 1862) the boy, aged twelve, had complete epispadias. In a case of Professor Verneuil's (*Bull. de la Soc. de Chir.*, t. viii. p. 68, 1859) the patient was the subject of hypospadias; the urethra turned spirally over the lateral aspect of the left corpus cavernosum to end below, and in the middle line, at the root of the scrotum. In a case of M. Guerlain's the penis, very little developed, was so completely rotated that its dorsal surface, so displaced as to be inferior, rested upon the scrotum, while its urethral surface looked upwards and to the left.

CHAPTER III.

CONGENITAL ADHESION OF THE PENIS TO THE SCROTUM.

In these cases the penis, sometimes entirely, save for the glans, is enclosed within the skin of the scrotum; sometimes the inferior aspect alone is adherent. In any case a webbed condition—"pénis palmé" of French writers—is the result, and the urine, instead of being projected, dribbles downwards over the scrotum, and, when erection occurs, the penis is curved downwards, the glans being sometimes the only part that projects from under the skin. This abnormality is often further complicated with hypospadias. Where this webbed condition of the penis co-exists with hypospadias the operation, which will consist of several steps—viz., procuring flaps from the scrotum, division, subcutaneously, of the usually shortened corpora cavernosa, separation of the corpus spongiosum from the corpora cavernosa, and then uniting the scrotal flaps to the under aspect of the penis—should, if possible, be completed before puberty, when the disturbing effects of erections are likely to make themselves much felt. Cases are quoted by M. Demarquay, from J. L. Petit (*Traité des Mal. Chir.*, t. iii., Supplément, p. 98), Dupont (*Mon. des Hôp.*, 11 février, 1853), and Bouisson (*Mém. sur l'Hypospadias*, p. 536). When this adhesion occurs by itself without any abnormality of the corpus spongiosum, it may be easily remedied by freeing the penis and closing the gaping wound which results with a flap taken from the ample coverings of the scrotum. Such was the course successfully taken in the following case ("Palmature pénienne sans hypospadias. Cause insolite de courbure de la verge:" Chrétien, *Gaz. Hebd. de Méd. et de Chir.*, 1887, t. xxiv. p. 501): The patient was aged twenty-five. The entire penis, save the glans, was imprisoned in the skin of the scrotum. The organ was markedly curved downwards, and only attained a very insignificant size when straightened. The curve was due to the corpus spongiosum, which was shorter than the corpora cavernosa, and partly separated from them. A transverse incision was made a little below the junction of the glans and the skin. The two lips of the wound, when pulled upwards and downwards, gave the wound the shape of a lozenge. When the opposing sides of the lozenge were sewn together the line of sutures was longitudinal. Continuous extension was employed to correct the curve due to the shortness of the corpus spongiosum. At the end of a few months the result was so good that the patient was able to marry.

CHAPTER IV.

DOUBLE PENIS.

THIS abnormality is excessively rare, and when it does occur it is likely to be complicated with other errors in development. One of the best reported cases is given by Mr. Ernest Hart (*Lancet*, 1866, vol. i. p. 71). The patient was a well-formed, healthy man, who had between his thighs a third limb, consisting of a thigh, leg, and foot, wasted and deformed. In front of this thigh was a shrunken, empty scrotum, bordered on each side by a well-developed scrotum, each containing a testicle. The penis was double, each organ being well formed and perfectly developed. They occupied the natural position; the left was somewhat the larger, apparently from having been used in preference to the other. Both became erect at the same time under excitement. The urine or the semen, as the case might be, was discharged simultaneously by both organs. Another interesting case, associated with hypospadias and not with fœtal inclusion, is given by Van Buren and Keyes (*Surg. Dis. of the Gen. Urin. Organs*, p. 5). The patient, aged forty-two, was stout and healthy-looking. There were two distinct penes of normal size, apparently well formed, lying side by side, each attached by its root to the symphysis. The right was rather the larger. Their covering of skin was common up to the base of the glans. Here each was entirely distinct and perfect as to external appearance, but the left meatus was imperforate. That on the right was normal, and the patient stated that most of his urine passed through this opening, some always escaping from a spot in the perinæum. Here, just where the root of the scrotum should have been attached, was seen, on lifting the double-barrelled penis, the orifice of a canal, admitting the finger, funnel-shaped, and in general appearance recalling the ostium vaginæ of a child. On the right side of this opening was an elongated rounded prominence, in outline like to a labium majus.

This contained a testicle, normal in shape and sensibility, and but slightly under-sized, surrounded, as was evident from its mobility, by a tunica vaginalis. The left testicle lay over the tendon of the adductor longus in the left groin. It was not fully developed. The patient had sexual desires, erections, and emissions. Both penes became erect simultaneously, the right more vigorously. The mammæ were normal. There had never been any phenomenon of the nature of menstruation. The left lower limb was several inches shorter and smaller than the right. This was congenital. In a case of M. Gorré's, brought by Professor Velpeau before the Academy of Sciences of Paris (*Compt. rend. de l'Acad. des Scien.*, 1844), the infant, eight and a half months old, had three lower extremities ; the penes were separated by four centimetres, the scrotum was divided and contained a testicle on each side. Each penis was provided with a urethra, urine being discharged from both simultaneously. In a case of Geoffroy Saint-Hilaire's, the two organs were also separate, and the urine or the semen escaped sometimes from both, sometimes from one organ only.

CHAPTER V.

CONGENITAL FISTULA OF THE PENIS.

A FEW cases of this most rare abnormality have been collected by Prof. Kaufmann in his article on "Diseases of the Urethra and Penis," in the *German Surgery*, edited by Billroth and Luecke. The fistula is situated on the dorsum of the penis, in the middle line, in some cases at the posterior edge of the glans, in others immediately in front of the pubic hair. It always leads into a canal running subcutaneously in the middle line as far as the pubes, where it sinks deeply. It may admit a No. 1 bougie. In two of the cases a necropsy was obtained. In one, a case of Luschka's, and examined by this authority himself, the fistulous track ended in several branches which proved to be the excretory duct of a gland lying on the sheath of the penis. This gland was connected by elastic tissue with the prostatic urethra and anterior wall of the bladder. Luschka considered that the gland and the fistula were really associated with a misplacement of part of the prostate gland. In the other case, one of Pribram's, who has discussed this subject fully, the necropsy was made by Klebs. The fistulous track ran beneath the os pubis and ended blindly, no glandular tissue being recognised in the adjacent tissue. A little above the orifice of the bladder, in the anterior wall of this viscus, was a funnel-shaped contraction which led into a narrow canal lined with mucous membrane, continuous with that of the bladder, and running forwards. This and the fistulous track from the penis were only separated by a thin membranous septum. In this case the dorsal aspect of the glans penis showed a median furrow reaching as far as the sulcus behind the corona. Klebs looked on this case as really a modification of the condition of epispadias.

A fact which is of some importance is pointed out by Kaufmann. In three of the cases the mucous canal, which is in connection with the fistula, became the seat of gonorrhœal inflammation, which the anterior position of the fistula in some cases explains readily.

The passage of a probe will show that the fistula is independent of the urethra, a point which the patient is likely to confirm by his statement that at no time has urine come away by it.

One other instance of fistula of the penis, of a different kind, has come under my care. In 1887, a City clerk, aged nineteen, came to me on account of what he described as a troublesome moisture about the end of his penis. There was no gleet. The meatus was normal; careful examination showed just behind the right lip two minute orifices just admitting a fine bristle. On the left side there were three of these openings. A fifth existed inferiorly to the left of the frænum. This was nearly half an inch in length. All appeared to be blind. In my opinion the trouble of these openings was largely mental. No urine came through them. But as it seemed probable that an attack of gonorrhœa might, by settling on these, become extremely troublesome, I advised their obliteration with a fine heated wire, which was carried out successfully.

CHAPTER VI.

ABNORMALITIES IN SHAPE AND SIZE OF THE PENIS.

Abnormalities in Shape.—Some of these are not uncommonly met with in cases of epispadias and hypospadias, and will be found fully described in works treating of diseases of the urethra.

A single instance of partly bifid penis has been described by Foster and Klebs. The glans and a small portion of the body of the penis were here split. The urethra opened, deeply, at the site of bifurcation. The right half of the glans was much deformed.

Abnormalities in Size.—Many instances of **rudimentary development** of the penis have been recorded. Most of them have been complicated with cryptorchismus or other abnormalities of the sexual organs. In other cases all the organs are present, but the infantile type is preserved throughout life. Some of these patients are weak in intellect; a similar condition is present in crétins. Kaufmann relates a case of Dummreicher's which occurred in a weakly boy of twelve. There the fault seems to have been deficiency of the corpora cavernosa. The penis was only ¾ inch long, as thick as a goose-quill, feeling as limp as a mere tube of skin of the same size would do, apparently consisting of urethra only, and its erectile tissue ending in a slightly developed glans. The corpora cavernosa were not entirely absent, but ran only from the ischium to the junction of the fixed and pendulous portions of the penis; at this spot they suddenly ended. Nothing could be felt of the prostate. The testicles were at the entrance of the inguinal canal.

A good instance of the persistence of the infantile condition of the genitals is given by M. Binet (*Bull. de la Soc. Anat.*, 1883, t. viii. p. 488). The patient was aged fifty-three. The genitals were of the size of a child of nine or ten. The penis was as large as a little finger, the scrotum contained on each side a testicle the size of a pea. There was no hair on the pubes. The face was also hairless and effeminate, giving the aspect of an old woman. The prostate was extremely reduced in size, and the vesiculæ seminales very simple in structure.

Occasionally, as in Wilson's case (*Lectures on the Urinary and Genital Organs*, p. 424), this condition is not permanent. This surgeon was consulted by a gentleman, aged twenty-six, as to his fitness for marriage, his penis and testicles very little exceeding in size those of a boy of eight. He had never felt the desire for sexual intercourse until he became acquainted with his intended wife; since then he had had erections attended with nocturnal emissions. The patient married, and became the father of a family, and those parts which at twenty-six years of age were so much smaller than usual, at twenty-eight had increased nearly to the size of those of an adult.

Of abnormalities in the opposite direction—viz., **unusual size** of the penis—there is no need to speak. Most of the recorded cases occur in ancient writers. Cases occasionally occur in which dyspareunia may be produced by a disproportion between the genital organs, but such cases yield to patience and common-sense treatment.*

If definite statements as to the normal dimensions of the penis are required, the following may be referred to. In the Army Medical Museum at Washington there are two injected specimens, divested of skin. These measure, in length, respectively, from the meatus to the pubes, 6½ and 5½ inches; from the extremity to the termination of either crus 9¾ and 8¾ inches; in circumference, 4¾ and 4¼ inches.

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* A case, apparently, of over-development of the corpora cavernosa is related in the *Philadelphia Medical Times* for Jan. 9, 1875. The patient was aged thirty-three, and increase in the size of the penis was said to have dated from the age of six years. The skin was normal. An incision showed that the increase in size was due to an hypertrophy of the spongy tissue of the corpora cavernosa. An attempted operation for removal of the hypertrophied tissue was abandoned, owing to the hæmorrhage.

DIVISION II.

ANOMALIES AND DISEASES OF THE PREPUCE.

CHAPTER I.

PHIMOSIS.

BEFORE this condition and its results are considered a few words may be said about **the development of the prepuce.** This fold, which, starting from behind the corona, begins to grow forwards about the third month, has covered the glans completely before birth, and, as a natural condition, the two are adherent to each other. This is seen in an examination of the parts in a newly born infant. The glans is completely covered, slight displacement of the prepuce just exposing the meatus and no more. If the penis be fixed, and the prepuce more strongly retracted, first the meatus dilates, then the prepuce is slowly peeled backwards, exposing a purplish-red glans. Both this and the prepuce may bleed slightly from the tearing through of the epithelial adhesions between the two, and the glans is seen to be velvety from a number of minute prominences on its surface. During the first few years of life the prepuce and glans should be separated by a **process of spontaneous loosening.** How far this is due to a caseation and cornification of the epithelial cells which form the adhesions, and how far to the erections—which even in these early days are frequent—is uncertain.

It is clear that if the process of spontaneous loosening be not properly carried out, the following results may follow—viz., **a narrow preputial orifice** and **adhesions,** more or less complete, between the prepuce and the glans. These **two conditions** are **combined in phimosis,** but must be distinguished the one from the other, as the latter yields to simple treatment, but the former, if the orifice be really narrow, will require operation.

Another distinction which it is very important to make in cases of phimosis is not only how far the condition is due to a narrow orifice and how far to adhesions, but what is the excess in length of the prepuce? Thus, in some cases the infant or child has only a prepuce of ordinary length, but narrow at its orifice. This condition may yield to gradual dilatation by drawing the orifice over the apex of the gland, aided by the use of a probe and vaseline. Another common condition is a prepuce much too long, loosely rolled spiral-fashion, and like an elephant's trunk in miniature. Such prepuces always call for circumcision. Other questions which are of some importance are whether the skin and mucous membrane are of normal thinness and suppleness, or whether hypertrophy and thickening, usually from inflammation, have followed. The varieties of partial and complete phimosis need no comment. Those of **congenital** and **acquired** phimosis will be dealt with fully.

As to the actual production of phimosis, we have seen that in the newly born this condition is a natural one, and that it should spontaneously disappear in the first few years of life. If it persist, the two conditions already alluded to have to be considered—viz., narrowing of the aperture and more or less close adhesions of the prepuce to the glans.

Symptoms—Sequelæ.—The symptoms proper of phimosis are a prepuce narrow and adherent; but as many children with phimosis are brought for symptoms which are really results of the above condition, and as it is of the utmost importance not to overlook a phimosis until it has produced many of these results, the symptoms and results of phimosis will be considered together.

1. **Urinary Troubles.** — These may be: (*a*) Difficulty in passing water, directly due to the tiny pin-hole aperture in the prepuce. Another group of symptoms which appears a little later includes the different results of the vesical and urethral irritation due to the retained urine, and the straining to get rid of it. Thus we have (*b*) frequent micturition; (*c*) retention, especially if there be a pin-hole prepuce; (*d*) incontinence; (*e*) symptoms of stone—viz., painful and difficult micturition, occasional hæmaturia from the delicate mucous membrane of the bladder and urethra becoming inflamed, and thus irritated by any retained and unhealthy urine, or by the crystals of uric acid which are so common in children unwisely fed; (*f*) When such a child is sounded the hypertrophied fasciculi met with on the floor of the bladder may, at first, give the impression that the sound

impinges on a foreign body. (*g*) If these results are allowed to persist, there is no doubt that by the time adolescence is reached grave alteration will have set in in the ureters and kidneys from backward pressure. Thus, about two years ago Mr. D'Arcy Power showed at the Harveian Society the urinary organs of a young man who had applied at St. Bartholomew's Hospital for relief of a phimosis. Shortly after the circumcision the patient was brought back with all the symptoms of uræmia. The necropsy showed great hypertrophy and fasciculation of the bladder, colossal dilatation and sacculation of the ureters, and disorganisation of the kidneys in an advanced degree.

2. **Dilatation or Ballooning of the Prepuce.** 3. **Formation of Preputial Calculi.**—These sequelæ are considered later, at p. 646.

4. **Balanitis and Adhesions.**—Instead of the prepuce becoming naturally and physiologically detached during the course of the first few years of life (p. 621), inflammation takes place owing to the irritation of retained urine, and adhesions form between the glands and prepuce, not now simply epithelial, but inflammatory and cicatricial, and so of a denser kind. They are of importance, as there is no doubt that the existence of one or two patches of adhesions, preventing the full retraction of the prepuce, may cause many of the sequelæ now given, as much as a complete and tight phimosis.

Keeping still to early life, we have—

5. **Hernia.**—In consequence of the frequent straining thrown upon the weak abdominal walls and the contraction of these upon the viscera within, and thus on the canals and rings which are as yet but feebly closed (this straining being brought about partly by the child's efforts in micturition and partly by his frequent crying at his difficulty), phimosis becomes a most important cause of hernia. The statistics on this point are very noteworthy. Dr. Kempe, when house surgeon at the Children's Hospital, Great Ormond Street, took fifty consecutive cases of congenital phimosis, and found that thirty-one, or sixty-two per cent. had hernia. Friedberg (quoted by Kaufmann, *loc. supra cit.*), in his investigations as to how far phimosis was responsible for the origin of hernia, found :—(*a*) That the number of boys exceeded that of girls by sixty-two per cent. ; (*b*) that twenty-seven per cent. of the boys suffered from congenital hernia ; (*c*) that the number of cases where several herniæ occurred was nearly twice as large in boys with severe phimosis as in those without phimosis ;

(*d*) after the removal of the phimosis the hernia disappeared, as a rule, in a surprisingly short time, this taking place the more quickly in proportion as the children were younger.

6. **Prolapsus Ani.**—It is easy to see how this may be brought about, in a weakly child with lax tissues, by the increased abdominal pressure which is due to phimosis.

7. **Thickening and Hypertrophy of the Prepuce.**—From the chronic irritation aided by the constant maceration in a little retained urine, the end of a long prepuce becomes reddened, chronically inflamed and thickened, especially in the children of the poor, where cleanliness cannot be carried out. Such a condition may easily lead to cellulitis and erysipelas, and, if advanced, may interfere with primary union when the needful but delayed circumcision is performed.

8. **Premature Sexual Excitement, Masturbation and its Effects.**—There is no doubt whatever that this habit may arise in the congestion and irritation brought about by phimosis,* and it is equally certain that the tendency to this habit is often noticed by mother and nurse, but is not sufficiently attended to from a natural but most harmful modesty on their parts. It begins in that constant tendency to priapism which is seen in infants and children with a long and tight prepuce. I have already spoken fully at p. 457 of the fact that masturbation has to be faced even in little children, and I have there spoken of some of its effects. I may allude here to another group. Prof. L. A. Sayre has described (*Orthopædic Surgery*, Lect. iii., and *Trans. Amer. Med. Assoc.*, 1875) cases in which premature sexual excitement in children, often set up by a tight prepuce, led to nervous irritation and exhaustion. In some cases this produced paralysis of certain groups of muscles, and thus, in one case, talipes equinovarus, and in another to constant flexion of the legs upon the thighs. Mr. Hilton (*Rest and Pain*, 5th edit. p. 276) many years ago drew attention to this question of phimosis and premature sexual excitement, by a case in which trismus, contraction of the knees, inversion of the left foot, and firm closure of the left hand, previously inexplicable, were cleared up by attention to the long prepuce and the habit which had followed on this condition.

Mr. Clement Lucas (*Brit. Med. Journ.*, 1884, vol. i. p. 852) calls attention to a form of late rickets associated with albuminuria, occurring about puberty and leading to flatfoot, weak ankles, knock-knee, &c., which he believes to be invariably due to masturbation.

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* M. Fleury, as long ago as 1852 (*Bull. de l'Acad.* t. xvii. p. 79), drew attention to the fact that phimosis led to exhausting erections and nocturnal emissions; further, to almost continual erection and masturbation.

I have already drawn attention to the fact that this premature sexual excitement may perhaps lead in children to convulsions, epilepsy, tuberculosis, and many other conditions otherwise not explained—viz., a stunted growth, pallor, anorexia, peevishness, &c. There is one other, and that a very common and grave disease, which may be alluded to in this place. Is there any relationship of cause and effect between premature sexual excitement and hip disease? It has been suggested by some writers, I think by Mr. Barwell, in this country, that exhaustion of certain nerve-centres may be thus induced, and that so the nutrition of a child's growing joints may suffer, thus leading to disease. Dr. Sayce has, it seems to me, given a more likely explanation of the relation of premature sexual excitement and exhaustion to certain joint diseases, and though the same objection may be made to his theory as to the one first given—viz., that hip disease occurs frequently in girls as well as boys, but that the long prepuce as a cause is present only in the latter—Prof. Sayre's view is so important that I give his words *in extenso*. "On April 7, 1870, three cases of hip-joint disease came to my office, one from Dover, N.J.; one was sent me by Dr. Walker, of Staten Island; and one by Dr. McSweeney, of Grand Street, N.Y. The two latter were little boys about seven and nine years of age, rather delicate in appearance, and each of them in the second stage of hip disease. After questioning in the most careful manner, I could find no local cause for the complaint. They had received no injury, fall, blow, or wrench of the joint that I could get any information about, and I was somewhat annoyed, as in the immense majority of these cases I have always been able to trace the disease to some local origin rather than to a constitutional dyscrasia. . . . . When examining the hips of the third case my thumb came in contact with his penis, which became erect almost immediately, and presented an exceedingly curious appearance. The penis was quite large, but very short, and had a long worm-like projecting prepuce, with an exceedingly small orifice, which admitted a small probe for nearly half an inch before the glans was reached. Anxious to know whether this condition of genitals was connected with any loss of muscular power in the lower extremities, I asked the fatl [illegible] he was active and spry on his feet previous to his getting lame, and he replied that he was the clumsiest boy he ever saw, in fact, he was tumbling down all the time. That he had always to hold his hand when he walked in the street, or he would be almost sure to tumble on the curbstone at every corner. His father said he had scolded him about his falling a hundred times, as he thought his clumsiness was owing to his carelessness."

Prof. Sayre argues from this and his other cases that the starting-point of the hip disease might be put down to a fall, this being due to the muscular debility produced reflexly, the hip disease then becoming aggravated by a succession of falls. On examining the other two cases of hip disease he found them "almost counterparts of the one just described, both in their history and in the appearance of their genital organs, except that the prepuce, instead of having a worm-like elongation, was unusually short and attached to the glans, nearly to the orifice of the urethra, which was reddened, and its mucous membrane swelled like a granular urethritis. The least irritation would produce an almost instantaneous erection."

9. **Balanitis. Posthitis,** or **Inflammation of the Mucous Surface of the Prepuce.**—The former result of phimosis may play a most important part in later life. Both it and posthitis are sometimes seen in children and boys, causing redness and œdema of the prepuce, muco-purulent discharge, and increased difficulty in micturition. If allowed to persist, they will aid in producing and keeping up another sequela of phimosis, mentioned below—viz., intensified venereal disease. The retained and decomposing smegma is a powerful source of irritation. Kaufmann mentions the case of a patient who always got a balanitis after every pedestrian tour.

I now pass on to certain important sequelæ of phimosis which are met with at a somewhat later age.

10. **Paraphimosis.**—While this is not unknown in childhood from the parts being pulled about from curiosity or from early lewdness, its chief importance is seen in adult life, when sexual intercourse is attempted. Thus it is occasionally met with in the newly married.

M. Guersant used to allude to a case of this kind in his Clinical Lectures as showing the need of operating on even a partial phimosis, if this condition persisted in the adult.

11. **Impeded Coitus.**—Phimosis leads to this in different ways. The production of paraphimosis has been mentioned.

Splits and cracks in the long and sensitive prepuce, which is thinned and stretched during coitus, are another source of great annoyance. Pain and difficulty in the act are very commonly spoken of. Interference with the development of the penis from a tight and adherent prepuce is another, though less important, result of a persistent phimosis.

12. **Intensified Venereal Troubles—viz., Gonorrhœa, Balanitis, Chancres.**—Mr. Hutchinson (*Med. Times and Gaz.*, 1885, vol. ii. p. 542) pointed out that "the circumcised Jew is very much less liable to contract syphilis than an uncircumcised person." That this difference is not to be accounted for by their superior chastity, or by their unwillingness to seek medical aid for such diseases, is conclusively proved by the fact that (though in the proportion of nearly one-third to the other patients) they furnish very nearly one-half of the cases of gonorrhœa. I have seen several cases of venereal warts where the misery has been much intensified by a phimosed prepuce, and one in which, thus imprisoned, they caused a perforation of the foreskin. Chancres, when thus concealed, are more prone to phagedæna and sloughing. The irritable condition of the inner aspect of the prepuce which is present in phimosis renders it more liable to abrasions during coitus, and thus to infection. A slight degree of phimosis is, by the lymphangitis and cellulitis which may complicate a gonorrhœa, quickly converted into the complete form, and, in a similar way, a mild degree of contraction may be rendered severe and intractable by the healing of chancres.

One other way in which a long prepuce may play a very important part in venereal disease must not be forgotten. Puche (Jullien, *Mal. Vénér.*, p. 308) relates the following case: A young girl was married to a man who benefited by her fortune. On the day of his wedding, the husband had connexion with a former mistress, and shortly after with his wife. A few days later a chancre appeared in the wife; the husband escaped. It appeared that he had a very long prepuce, and had taken no precautions of cleanliness after the first coitus. Ricord has recorded a similar case.

13. **Epithelioma of the Penis.**—The frequency with which phimosis acts as a predisposing cause here, and the explanation of this, are fully dealt with a little later.

Treatment of Phimosis.—The literature on the treatment of congenital phimosis is voluminous, and the opinions given are often contradictory; some writers holding that as the adhesions between the prepuce and the glans tend to disappear naturally, treatment is uncalled for; while others consider that treatment should always be both early and energetic.

The chief aids to a decision here are the degree and kind of the phimosis, and the rank of life of the child.

We will suppose an infant brought to the surgeon with the inquiry whether "anything requires to be done" to the foreskin. As I have said before, it is the narrowness of the orifice and the length of the prepuce which have to be considered, rather than any adhesions which may be present. Supposing the prepuce to be only adherent and of proportionate length to the penis, and not narrow enough to interfere with micturition, should the surgeon be content to leave things as they are, and trust to that natural disappearance of the adhesions which will take place gradually in childhood or at the time of puberty? If we could be certain that no inflammatory changes will occur to interfere with the above natural loosening and separation, we might safely hold our hands where the prepuce is simply adherent in infants. But as the above changes may follow at any time, and as interference will be increasingly painful the longer it is deferred, it is always wiser to advise an artificial separation of the prepuce in every case. The penis being fixed, the prepuce is drawn back as far as possible, this step usually exposing the anterior third or half of the glans. Complete exposure of the glans is then effected by keeping up the retraction of the prepuce, while a clean probe dipped in carbolic oil is swept over and around the dorsum of the glans, breaking down the adhesions, this and the retraction being kept up until the prepuce is behind the corona. Any collection of smegma is then got rid of, the parts smeared with oil or vaseline, and the prepuce at once returned.* The little œdema which follows soon disappears, or is readily met by the application of water dressing or lead lotion. The retraction, drying, cleansing and oiling are to be repeated daily, until the prepuce slips backwards and forwards quite easily. After this, regular washing of the parts daily, as a matter of course, will be all that is required, while it serves to harden the surfaces, and so to prevent that sensitiveness and liability to irritation which have been seen at p. 624 to be followed by serious results.

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* Whether the retraction be performed by a mother or nurse, or, later on in life, by the patient himself, the warning ought always to be given that paraphimosis may be produced by too violent retraction.

The same treatment will often suffice in older patients if the prepuce be merely adherent, not too long and not too narrow.

But, whatever be the age, if the prepuce be disproportionately long, loosely rolled spiral-fashion, like an elephant's trunk in miniature; if there be a pin-hole orifice; if separation of the adhesions is not possible; or if it be followed by troublesome œdema, or is not carried out properly from misplaced sympathy on the part of the mother or nurse; and if any of the sequelæ detailed at p. 622 are present or threatening,—operative steps will be required.

As to dilatation by forceps, special dilators, small glove-stretchers, laminaria tents, &c., none of these are to be recommended. They are always tedious, and very often unsatisfactory in their results, while they may easily produce cracks and ulceration in the preputial orifice. The difficulty with any of the above, as with injections of oil, &c., is to get them beneath the mucous layer, which, whether adherent or no, is always short and in intimate connection with the glans. Now that anæsthetics can be so safely given, no object is to be secured by wasting time with the above measures. In only two cases do I consider perseverance with them justifiable—*i.e.*, when the patient is known or believed to be the subject of hæmophilia, or of diabetes.

1. **Exposure of the Glans by Dorsal Incision.**—A grooved director being passed from the opening to the corona in the middle line of the dorsum of the prepuce, and made prominent beneath the skin so as to prove that the point of the instrument has not entered the urethra, a sharp-pointed, slightly curved bistoury is then run along the groove, the skin is transfixed and the prepuce entirely slit up. If, as usually happens, the mucous layer escapes in part, this must be divided with scissors. Any adhesions are then completely broken down. It is well next to trim round neatly the corners of the two flaps respectively from above downwards, and from behind forwards, up to the frænum. If this is done, it practically converts the operation into a circumcision. If it be not done, there is a risk of the flaps long remaining redundant, and very clumsy looking. This is especially likely, if the prepuce operated on be the seat of chronic inflammation and œdema.

2. **Circumcision.**—This simple operation may be performed in many different ways, but the following points must be remembered in every case: (1) Enough of the mucous layer of the prepuce must be removed. If this is not done, some degree of

the phimosis is certain to persist, a result which is sure to bring discredit, as the patient or his parents will not be ready to sanction a second operation. Moreover, in adults especially, owing to the tension which remains on the glans, troublesome priapism will occur, interfering much with the process of healing. Later on, during erections the coverings of the penis will be tightly stretched. (2) On the other hand, too much of the prepuce must not be removed. It is always well, particularly in adults, to leave enough to cover easily the sensitive papillæ with with which the corona abounds. Moreover, in the case of the diminutive organ of infants, it is very easy to remove so much as almost to flay the body of the organ (*vide infra*). (3) Too much tissue must not be left in the neighbourhood of the frænum. Mr. Howse has drawn attention (*Guy's Hosp. Rep.*, 1873, p. 239) to this matter. As the cellular tissue at this spot is loose and abundant, and as the frænal artery is comparatively large, blood and inflammatory effusion will gather here very easily. This may lead to the formation of a persistent lump, rendering the case annoyingly tedious in children, and, in adults, interfering with the function of the organ. (4) Care must be taken not to inflict any injury on the meatus and glans which are usually hidden within the prepuce. (5) The parts—and this applies especially to the larger wound of adults—are to be kept as aseptic as possible. As this operation is always looked upon as a trifling one, I will here quote a case related by Sir J. Paget in his essay on "The Calamities of Surgery" (*Clin. Lect. and Essays*, p. 67): "Look to the sanitary arrangements about the man. One of the greatest annoyances that I have ever had was in the case of a gentleman whose prepuce I divided for phimosis. Severe it was, and necessary to be cured. I divided his prepuce and no more; neither put in a suture, nor did anything that could disturb the healing of the wound. The cut was followed by sloughing of the integuments over two-thirds of the penis and very nearly the whole of the scrotum. I found, on looking about for what could have caused all this misery, that the patient, although living in a very good hotel, had a water-closet in his bedroom. I had looked round the room, not carelessly, before the operation, to see whether there was anything that could bring him into mischief, and all had appeared fair. But what I had taken to be a bookcase, or some article of furniture of that kind, was a water-closet, which, with the nastiness with which some London hotel-keepers provide for the convenience of their customers, had been put into the bedroom."[*] (6) After the operation the patient should rest as much as possible (p. 634).

The following will be found a simple method of operating, and one that will give good results. The patient should first be brought under the influence of A.C.E. mixture, or ether, unless it is thought advisable, in the case of a child who is addicted to masturbation, to submit him to pain as a warning and a lesson.[†] Where the operator is really single-handed, as may occur in general practice or on board ship, cocaine may be used. A solution of 1½ grains of the hydrochlorate of cocaine may be injected into the tissues of the prepuce, equally on either side, or two minims of a 10 per cent. solution may be injected at four spots, one on either side, and one above and one below. If a 4 per cent. solution be at hand, four drops may be injected at four spots around the prepuce. If the prepuce is merely long and not adherent, some of these solutions may also be painted over its mucous aspect. I do not myself recommend the use of this local anæsthetic, save in special cases. Though I have found the cutting practically painless, or spoken of "only as a dull aching," the punctures of the hypodermic needle and of the sutures have been bitterly complained of, and the immediate after-pain is, from the consciousness of the patient, keenly felt.

In the case of a boy or adult, a tape, or a Jacques' catheter, or a drainage tube is tied round the root of the penis, or an india-rubber ring of suitable calibre employed. In the case of a child no such precautions need be taken. The operator now grasps the foreskin somewhat obliquely, downward and forwards, with a pair of dressing-forceps, care being taken that the glans is not included. Mr. Davies-Colley ("Note on the Operation of Circumcision," *Guy's Hosp. Rep.*, 1893) points out that at this stage the glans penis often retracts, from the effects of cold, nearly to the root of the penis, and thus the shave of the knife in front of the forceps may remove far too much skin. If, therefore, this retraction of the penis be found to have taken place, the forceps must be applied further forward. The operator makes certain that the glans has slipped back, and the assistant, while holding the forceps firmly, should be careful not to bruise the parts. The operator, making tense the end of the prepuce, shaves off the part in front of the forceps by means of a very keen knife, with the following precautions. As the knife makes the lower part of the section care is taken to turn it slightly forwards so as to leave a little triangular layer of skin on the middle of the under aspect of the prepuce which shall fill up subsequently that triangular gap which is otherwise left when that part of the mucous membrane to which the frænum is attached is snipped away. Mr. Davies-Colley (*loc. supra cit.*) thus advises the providing of this little point of skin. "The surgeon should now apply the knife in front of the forceps and cut through the dorsal half of that which is grasped. Next, after removing the forceps, he should cut through the rest of the skin with scissors downwards and forwards, so as to leave a sharp point. On removal of the forceps the cutaneous layer of the prepuce at once retracts, and should do so up to the corona, &c." The mucous membrane, which usually adheres closely to the glans, is next slit up with blunt-pointed scissors exactly along the middle line up to, but not beyond, the corona. If this mucous layer be extremely thick and altered, care must be taken that the scissors have not entered the meatus. The mucous membrane is next peeled off in two flaps from the glans. This—not always an easy matter when the small parts of a little child are dealt with—is best effected by seizing each flap between the finger and thumb of the left hand and using the index nail of the other, or a stout probe. All smegma is cleanly got rid of and every trace of an adhesion must be thoroughly broken down until the entire glans and the sulcus behind it have been exposed. The next step is to clip away the mucous layer of the prepuce by rounding off the cut edges with scissors which are made to follow the curve of the glans, leaving all round this a collar of uniform width, so as to hold the sutures easily. I prefer to cut away the frænum and the prepuce, which is still attached here rather closely, by V-shaped incisions pointing forwards; the gap thus left will be neatly filled up by the little triangular flap, to the formation of which Mr. Davies-Colley rightly attaches so much importance. The cut margins—cutaneous and mucous—of the prepuce are now united with sutures of very fine catgut. The smallest possible needles should be used, and the sutures passed quickly through skin and mucous membrane with a stabbing movement, and without bruising the edges with forceps. No sutures are needed in little children. The gut should not be tied too tightly, so as to allow for the tension of the œdema which is likely to occur. Too many sutures should not be inserted. If wire, silk, or horsehair are used, they may, in a nervous patient, give much trouble when they are removed. In such a case ether should be given. When the stitches are passed any bleeding points should be transfixed, and the abundant cellular tissue kept in its place by means of a probe. This must on no account be cut away, as in it run the vessels to the prepuce. The hæmorrhage, unless in parts recently or chronically inflamed, is usually trifling. It may be arrested by taking up any bleeding points in the suture, by leaving on one or two pairs of Spencer Wells's forceps for a few minutes, or, as in the case of the frænal artery, by fine catgut ligatures. All bleeding must be stopped, especially in adults, or the extravasation of blood in the loose connective tissue will lead to tension, cutting through of the sutures, and sloughing. Oozing* will be checked by using very hot solutions of boracic acid or mercury perchloride.

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[*] A death of a healthy adult aged seventeen, from erysipelas after circumcision, is recorded in the *Lancet*, 1882, vol. i. p. 308.

[†] In this case plenty of assistance must be at hand.

For a child no dressing is needed, if the parts are kept dusted with iodoform. If preferred, a strip of antiseptic gauze may be wrapped round the part, the ends crossed once and attached by thread to a bandage round the waist so as to prevent œdema of the wound. The child will pass water, if turned on its side. If there be any difficulty, he should be placed in a hot bath. The dressings must on no account be too firmly applied, the meatus must be left exposed, and a cradle should be at hand to keep off the bed-clothes; a wood-chip hat-box makes a very efficient substitute. In a little child the first dressing may be soaked off in a bath.

For adults, one of the following plans will be found the best. When the parts are already inflamed, and likely to be swollen, or where erections may be troublesome, I prefer iced, boracic-acid dressings, two layers of boracic-acid lint being wrung out of a saturated solution of the lotion. The deeper layer has a hole cut to allow of micturition and is only removed by the surgeon; the outer one envelops the whole penis, and may be removed and re-wetted by the patient every three hours; in the interval it will be enough for him to keep it wet by dropping on a little lotion from time to time.

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* If the patient should happen to be a bleeder his condition will be one of great peril. Probably turpentine aided by constant digital pressure would be as useful a step as any; excessive pressure is, of course, liable to cause gangrene. If there was any reason to suspect that a patient about to be submitted to circumcision was the subject of hæmophilia, the operation should be put aside, or deferred if possible, until after puberty. The following case, recorded by Grandidier, is a good illustration of the uncontrollable occurrence of preputial hæmorrhage, in which limitation by age, by sex, and by atavism were, as usual in the commoner forms of the hæmorrhagic diathesis, associated together. In a Jewish family near Hanover, four male infants—each of whom was descended from a different grandchild of a common ancestress, through the female line, four generations back—died from hæmorrhage consequent on circumcision performed on the eighth day after birth.

Another dressing, simple and ingenious, and admirably adapted for boys or adults, in cases where no inflammation is to be expected, is one described by Mr. Ballance (*St. Thomas's Hosp. Reports*, vol. xvi. p. 198). It consists in a dry dressing of gauze, the outer and larger covering consisting of a single layer, and its margins being kept in position by collodion. It will be found as effective as it is simple, and, as it can be left on for some days, it prevents the pain of frequent dressing.

Whatever dressing is used in adults, it will be advisable to give bromide of potassium in large doses, say 20 grs. t. d. s., or 30 grs. at night-time.

After circumcision the patient should rest as much as possible. An adult should lie in bed for forty-eight hours, and keep on a sofa for a week, the sutures being removed (unless softened) at intervals. If the patient insist on getting about too early, he must run the risk of the healing being delayed and the parts remaining long œdematous and tender. And for this reason with hospital patients who have to be brought backwards and forwards, early healing by primary union is not to be expected, especially when the restless movements of the lower limbs which are constantly going on are remembered. During this time the ununited wound must be kept well smeared with a little iodoform ointment, or carbolic oil.

Complications and Harmful Results of Circumcision.—Amongst these are the following, and many of them have already been alluded to: (1) **Insufficient removal of the prepuce** whether of the cutaneous or mucous layer, and thus a recurrence of the contracted orifice. (2) **Too free removal,** leading to a needlessly large and tedious wound, and exposure of the body of the penis. (3) **Injury to the glans and meatus.** (4) **Hæmorrhage.** This may be due (α) to some vessel which had not been twisted or secured by the sutures (perhaps from the fact that during the influence of the anæsthetic it did not bleed), hæmorrhage after the operation, especially if the patient has moved about. (β) To the patient being the subject of hæmophilia.

(5) **Cellulitis. Erysipelas.**—In an operation like this, usually performed upon little children, with sources of contamination close by, and the almost incessant restless movement of their

thighs, save during sleep, there must always be a difficulty in securing an aseptic result, especially in out-patient cases, which have to be brought backwards and forwards. As is often the case in infants, the erysipelas may take the form of E. errans or ambulans, in which, while the disease seems to subside in one part, it soon breaks out in another.[*] Erysipelas will be especially dangerous if the funiculo-vaginal process of peritonæum is patent.

(6) **Infection with Syphilis.**—The wound of circumcision may be thus infected in two ways—(*a*) It has long been known that this has taken place when the operator in a case of ritual-circumcision has sucked the wound, and thus contaminated it from mucous patches in his mouth. Such cases are not by any means unknown on the Continent.[†]

(β) Mr. Hutchinson has proved that another means of conveying syphilis by circumcision exists (*Syphilis*, p. 115) in the instruments or dressings used. In investigating a group of cases of circumcision-syphilis he found that the explanation of contamination by the mouth of the operator did not apply. "The priest who had done the operations assured us that he never sucked the penis, and he was, besides, a man of good age, and wholly free from syphilis. The facts were briefly these:—During a period of about six weeks this man had been giving syphilis to his patients; not to all of them, but to one now and then. He was in large practice, and the great majority of those circumcised by him, during this period, had wholly escaped. There was an interval of at least six weeks between the first infection and the last. I saw the cases in conjunction with my friend Mr. Charles Macnamara, and we were shown seven young children, all of whom had the circumcision wound still open, and the symptoms of syphilis on them. The group illustrated, in a very instructive manner, many of the laws of syphilis. In the first place, I will show how the contagion had been effected. We examined, to begin with, the operator himself. He had no sore on his hands, nor had he the slightest indication of having ever suffered from syphilis. His instruments, a knife and thin metal shield, were clean (as might be expected when shown to us), and he asserted that he invariably washed them after each operation. This statement may go for what it is worth, but it will, I think, be admitted to be most improbable that contagion could be conveyed by a knife which was in daily use over a period as long as six weeks. A clue was given us on our being told that it was the custom of the priest to take the foreskin home with him, in order that it might be ceremoniously burnt. Before hearing this I had got a strong impression that the vehicle of contagion must have been the lint used for dressing. On our asking where he put the foreskin, he told us that he always placed it in his instrument-box, under the lint, adding: 'See here, this is the place; you can see the stains.' There, sure enough, on the silk lining of his box were abundant stains of blood, and apparently of pus. Here prepuce after prepuce had been placed, the fresh blood of one remoistening the dried-up fluids left by its predecessor, and directly on these were laid the strips of lint which were to be used as dressings. The discovery seemed to fit precisely with the facts. No doubt the beginning had been the circumcision of a syphilitic infant. Our informant told us that in the case of delicate children, the rite was often deferred for some months, and thus it was quite possible that a child in whom the disease was fully developed might have been its subject. Probably, however, it is not necessary to have recourse to such a supposition, since the blood of an infant a week old may have the virus in an active form. It will be seen that the explanation presupposes that the virus may retain its activity for a considerable time (six weeks), and that too in spite of its being in a dried state. There is nothing, however, in the least improbable in this.

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[*] In a paper (*Allgem. Wien. Med. Zeit.*, Nov. 17, 1874) it is stated that Dr. Levit, in a practice of thirty-five years, saw six infants die from the results of circumcision. The Jewish law forbids the performance of the operation in any child not in perfect health.

[†] Kaufmann gives the following references: Wolfers (Henke's *Zeits. f. Staatsarzheilkunde*, Bd. ix. S. 205); Rust (*Helkologie*, 1811, Bd. ii. S. 13); Theiner (*Hufeland's Journal*, Bd. liii. p. 127); Tuisen (*Die Sitten, Gebraüche und Krankheiten d. alten Hebräer*, Breslau, 1853). This contains an account of Jewish circumcision well worth reading.

"Amongst the features of interest, apart from the mode of contagion, which this series of cases illustrated, were the following: the very unequal severity of the disease, even when derived from the same source, and the occurrence of suppurating buboes with infecting sores. In only one of the seven infants could it be said that any part of the circumcision wound was definitely indurated. In most it was large and ragged, and in two it had partly destroyed the glans by a mild form of phagedænic action. Two of the infants were fat and apparently healthy, although both showing eruption. Two were emaciated and very ill, and two were moderately so. One looked so feeble as to suggest the belief that it would not recover, and as a matter of fact it died a fortnight later. In this case the infant was quite well up to the time of circumcision, and it had been carefully treated by mercury almost from the first. In some of the infants the eruption was very scanty, in others copious. All had enlarged glands in the groin, and in two suppuration had occurred on both sides, open sinuses being still present. In those in whom abscess had not occurred, the buboes were yet of unusual size. It was impossible to obtain any accurate dates or statements as to the progress of the circumcision sores; usually at the end of about a month it had been noticed that the partially healed wound was reopening and inflamed."

(7) **Infection with Tubercular Virus.**—This is a matter of even greater importance, as in many cases of syphilis the contagion has taken place by the mouth of the operator, but it is obvious that there are many other ways in which the wound may be infected. As in the case of syphilis, most cases of tuberculosis, as a sequela of circumcision, have been reported from the Continent. Lindmann observed two cases in 1873, and Lehmann reported ten others in 1879. It is probably to these that Mr. Barker referred in his "Hunterian Lectures on Tubercular Joint-Disease" (*Brit. Med. Journ.*, 1888, vol. i. p. 1205). Of nineteen Jewish children submitted to circumcision in a Continental town, sixteen were operated on by one man, the remaining three by others. In every case the bleeding was stopped, as was customary, by the application of the mouth to the prepuce. This part of the ritual is often carried out by different individuals, sometimes members of the family, sometimes the operator. In the present instance the sucking was performed in ten cases by the functionary mentioned above, as having circumcised sixteen of the children. In the remaining nine cases the application of the mouth to the prepuce was made by other members of the community. All these last nine cases recovered perfectly from the operation, but the other ten were affected with very serious disease between the eighth and twelfth day, and in the same way. The wounds or scars first became the seat of nodules, then of unhealthy spreading ulcers. In about three weeks the inguinal glands became much enlarged. In three cases the glands did not suppurate, but the patients died with all the symptoms of tubercular meningitis within a few months. In the remaining seven the glands suppurated, and four of these died, one of intercurrent diphtheria, three of marasmus. Dr. Lehmann found that

the operator on these ten children had been a patient of his own during the period of the outbreak, with advanced phthisis and characteristic sputa, and that he succumbed to the disease shortly after the last of these circumcisions. Other papers to a like effect have been published by Eisenberg (*Ber. Klin. Woch.*, 1886, S. 582); and W. Meyer (*Centr. f. Chir.*, 1887, S. 860). In these cases also the wound was infected by the mouth of a phthisical operator. The following case, published by Mr. Eve (*Lancet*, 1888, vol. i. p. 170), is of much interest from the small size of the primary local lesion when the case was seen, and the method of contamination of the original wound:

A Jewish child, aged five months, was admitted into the London Hospital, August 23, 1887, with a large fluctuating swelling in each groin, the skin over them being red and thinned. At the site of the frænum was a small superficial sore. The abscesses were opened and scraped out, pus and caseous matter being evacuated. The mother stated that the child had been circumcised when eight days old, and the wound appeared to heal properly. Six weeks afterwards she noticed a small swelling in each groin. Mr. Eve found out afterwards that the operator in this case had died from consumption. He had not applied his lips to the wound, but he ejected some wine from his mouth over it after removing the prepuce. The child's parents were both healthy. Living in the same house was another woman whose infant had been circumcised by the same operator in 1876. Abscesses had formed in the groins in this case six or seven weeks after the operation. Being suspicious as to the contents of the abscess in the first case, Mr. Eve introduced some of the caseous material beneath the skin of the groin of a guinea-pig. The neighbouring glands soon enlarged, and when the animal was killed, in the course of ten weeks, general, intense tuberculosis of the lungs, liver, and spleen was found, the disease having extended from the inguinal glands along the iliac to those in the lumbar regions.

Acquired Phimosis.*—Many of the above remarks on congenital phimosis will apply to this variety also. Acquired phimosis is not uncommon in hospital practice—*i.e.*, in those who, having a long prepuce, however movable, have exposed themselves to the inflammatory changes in the foreskin which will follow on the œdema of acute gonorrhœa, balano-posthitis, warts, and inflamed or sloughing chancres. Tears in the edges of a moderately tight prepuce will, as they heal, produce a severer form.

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* I have described this and the next condition here for the sake of convenience. Otherwise they should have been placed under the heading of "Inflammatory Diseases of the Penis."

Quite apart from venereal disease and coitus, phimosis may be brought about by elephantiasis, and by the balanitis which occurs in the subjects of lithiasis, and still more in the diabetic form (p. 657). Another instance occurs from time to time which may be of importance in cases of retention of urine. In old men, where the erectile tissue of the penis has undergone marked atrophy, a long prepuce may considerably overhang the glans. In two such cases of retention, where the meatus could not be hit off with the catheter, I had to slit up the prepuce,

Treatment.—In many cases of acquired phimosis, as where it occurs as a complication of gonorrhœa, wrapping the penis in lint constantly wetted with lead lotion, and keeping the organ well up against the abdomen, if the patient lies down continuously, will usually, aided by a smart purge, quickly reduce the swelling. If any basis of chronic inflammation remain from previous attacks, circumcision should be performed.

But it is in the cases of phimosis complicated with inflamed and sloughing chancres that prompt treatment is most urgently required. Syringing here, to do any good, is required every half-hour, tepid water followed by lead lotion, or an antiseptic one, being employed. But where the parts are too swollen to admit of this, when the discharge from beneath the prepuce is fœtid or blood-stained, not an hour should be lost in giving ether and slitting up the prepuce on the dorsum as far as the corona. After the bleeding points, which will be numerous, have been secured, the parts should be thoroughly cleansed with pledgets of antiseptic wool, which are burnt at once, and nitric acid should be applied to every part of the sloughing surface which is exposed. If less severe measures seem sufficient after the glans is thoroughly exposed and investigated, iodoform may be carefully dusted on, and the patient may be covered with blankets and placed in a hot bath, of which the temperature is kept up to about 98 degrees by the constant addition and renewal of hot water. The patient should sit in the bath, continuously, eight, nine, or ten hours, leaving it for a slight rest in bed at night, when the iodoform treatment is to be continued. If the immersion treatment does not quickly relieve, nitric acid should be thoroughly applied, and, always, with the aid of ether. Morphia must be given afterwards, and the separation of the sloughs may be hastened by hot boracic-acid lotion, or a charcoal poultice. Opium and quinine, without specific treatment, will be found of little use. Mr. Hutchinson states (*Syphilis*, p. 154) that he has seen some cases in which, to complete the cure of the phagedæna, it was necessary to send the patient to the seaside.

Some may ask, is there not great danger that, after the prepuce is slit up, the edge of the wound will also take on a phagedænic ulceration, similar to that of the original chancres? The answer to this is that, nowadays, with our remedies of nitric acid, immersion, and iodoform, the risk, which was formerly a very serious one, need not be taken into account. Some writers—*e.g.*, the late Mr. Berkeley Hill (*Syphilis*, &c., p. 601)—advocated complete removal of the prepuce, on the ground that simply slitting it up does not completely expose the disease, when, as is usually the case, much swelling is present, and, also, because a further operation will be required for the removal of the flaps made by slitting up the foreskin.

Each case must be decided by itself. Subsequent removal of the flaps is certainly not always required; it is only when there is great swelling that a free dorsal incision will not admit of a thorough examination of the disease beneath. In a weakly patient, the loss of blood which will be involved by a circumcision at this stage, when all the smallest vessels bleed furiously, must be taken into account.

PARAPHIMOSIS.

This condition, when the prepuce, having once been retracted behind the glans, cannot again be brought forward, has already been mentioned amongst the sequelæ of phimosis. It may occur independently of any co-existing disease, or may be symptomatic of some mischief in the prepuce, glans, or urethra. The former variety, which some have called accidental, is not unfrequently seen in boys; it may be also set up by coitus in men who uncover the glans with difficulty. Occasionally the surgeon may be in danger of producing it himself when he tries in the case of a subacute phimosis, to retract the prepuce to clear up mischief beneath.

Paraphimosis is more common as a complication of venereal diseases—*i.e.*, as the symptomatic variety. Thus, when the foreskin is short or is habitually retracted, anything that causes swelling of the glans—viz., gonorrhœa, chancres, balano-posthitis, or warts—may prevent the prepuce from being drawn forward.

Whatever be the cause of the paraphimosis, it is to be looked upon as a serious complication, more so than phimosis, because of its tendency to bring about strangulation of the glans. In addition to the accidental and the symptomatic varieties which have been already mentioned, others may be met with according to the degree of the inflammation—viz., the acute, the sub-acute, and the indolent.

In the first two the following appearances are present to a varying degree: The glans is swollen and purplish red. Immediately behind the glans, and most marked below, rises a tense, glazed, œdematous collar of mucous membrane, intensely swollen, purplish or dusky red, or even black; this is the mucous layer of the prepuce. Behind this is a furrow or fissure, deepest above, and behind this again, another fold, the outer or cutaneous layer of the prepuce. Behind this is another sulcus, and more posteriorly, in a severe case, a thick collar, like the second, covered by skin: this, unlike the first two, is not continuous, anteriorly, with the parts about the frænum, but encircles the penis transversely. The skin of the penis is more or less swollen, and this organ may be bent or spirally twisted, giving the most singular appearance. The number of folds, the site of the strangulation, and the sulcus which marks this point vary somewhat according to the way in which the paraphimosis has come about. In some, and these are the most common cases, the prepuce is wholly reversed and rolled back over the glans, as happens, normally, when the glans is uncovered, so that the orifice of the foreskin is the part most distant from the glans and carried farthest back along the body of the penis. In other cases the prepuce is just rolled back or reversed, its orifice is simply carried back reaching the sulcus over the glans till its return is stopped by the corona, and thus interference with the circulation is soon brought about. It will be seen that there may easily be at least two points of strangulation—one immediately behind the corona in the mucous fold of the prepuce, the other farther back along the penis caused by the orifice of the prepuce; between these points are the sulci in which ulceration may be hidden.

Kaufmann points out that in cases where the site of strangulation is situated far back, the frænum must either be a long one or have ulcerated.

Chronic Paraphimosis.—This, which is also known as indolent paraphimosis, may follow on the acute variety, when the inflammation has not run very high, or it may occur by itself, and, as it were, spontaneously. The swelling is now devoid of inflammation. The only case of the kind that I have seen was due to the patient wearing a truss of needlessly strong pressure. When the cause was removed the mischief quickly disappeared after the penis was kept up against the abdomen and strapped (p. 643).

If a paraphimosis is not reduced at once the parts become inflamed, the swelling especially affecting the anterior and lower part, owing to the looseness of the cellular tissue here and its dependent position. The tension becomes extreme, and if the condition is left to itself **spontaneous relief** is given in one of two ways: either the constricting ring or rings ulcerate, and thus the strangulation is relieved, or the circulation being interrupted in the glans, this part mortifies. The former is most common. As far as I have seen, the glans very seldom perishes in paraphimosis, unless chancres, especially sloughing ones, are present.

The following **complications** and **sequelæ** are worthy of note: Phlegmonous **erysipelas** and **cellulitis, lymphangitis, phlebitis**, and burrowing **suppuration.** If the tension is not timely and thoroughly relieved, the natural cure following ulceration may result in what remains of the prepuce after sloughing being fixed by **adhesions,** which daily become firmer, to the sides and dorsum of the penis, with extensive **scarring, a mutilated glans, urinary fistulæ,** and **persistent lumpy swelling.** This last, for reasons given above, tends to persist especially below, in the vicinity of the frænum. It may be here so developed as to take the form of a bird's crop, the *jabot sous-préputial* of M. Mauriac.

Treatment.—Any case of paraphimosis, however complete, can be reduced if taken early, if ether be given. The patient being deeply anæsthetised, punctures are made, if needful, into the œdematous folds, especially below, and bleeding encouraged by lint wrung out of warm boracic acid. The surgeon then takes the penis between the index and middle fingers of each hand and steadily pulls the skin of the organ forwards, much as if he were going to lift the patient off the bed by his penis; while this traction is steadily and continuously maintained, the two thumbs should press upon the glans at first from side to side, and then from before backwards. It is always important to remember that relief will be given rather by pulling the constricting part over the glans than by pushing the glans through the constriction. If this fail after a careful, patient, steady trial, Mercier's method may be tried. The penis is grasped with the left hand, laterally, while with the right compression is made on the glans; at the same time an endeavour is made to insinuate the right thumb-nail under the constriction. If this is successful the strictured part is drawn up over the nail, and then over the compressed glans.

If every attempt at reduction fail the point or points of stricture must be divided. The simplest and quickest way of effecting this is to make a free incision, commencing on the dorsum of the penis, well behind the most posterior fold and sulcus, and to carry it forwards, well up to the corona. This incision should go down to the tunica albuginea of the penis. Plenty of small incisions should now be made into any parts which remain œdematous, and the whole penis being wrapped in lint wrung out of hot boracic-acid lotion and dusted with iodoform, is kept raised against the abdominal wall. The patient's bowels should be well opened, and his strength maintained by nourishing fluid and semi-solid food.

Where the paraphimosis is of a more chronic kind, where there is less urgency, or where an anæsthetic is refused, an attempt may be made to reduce the swelling by pressure. Strips of plaister are applied longitudinally, starting from the root of the organ, passing along the dorsum over the glans, and then ending on the under surface nearly opposite to where they began. The penis is thus surrounded and compressed by longitudinal strips, care being taken to leave the meatus uncovered. A long piece of strapping is then wound circularly round the penis, starting just behind the meatus, and carried up beyond the swollen part. After a few hours the strapping may be taken off and reapplied, or reduction at once attempted. If the patient is under an anæsthetic, a better mode of utilising pressure is by means of a narrow strip of india-rubber bandage applied from before backwards. This will often greatly facilitate attempts at reduction, but if applied so firmly as to be useful, it will require an anæsthetic.

I have one most important hint to give in these cases, and that is, that if there be any reason to suspect the presence of syphilis the surgeon should apply some silver nitrate or a "sealed dressing" to any abrasion or hang-nail on his fingers, and then put on a pair of old gloves. If any venereal sores are present they should be thoroughly destroyed with nitric acid. I have seen two cases, one in London and one in the country, in which medical men, while reducing a paraphimosis, infected themselves with syphilis.

In one case the practitioner, who was also an artist, had at the time several small sores about his finger-tips from the use of turpentine in cleaning his paint brushes.

DEFICIENT DEVELOPMENT OF THE PREPUCE.

1. **Congenital Absence of the Prepuce.**—Formerly much importance was attached to this condition. Many regarded it as a result handed down by a long continuance of circumcision. This has been disproved by Roth (*Correspondenzbl. f. Sweitzer Aertze*, 1884, S. 441). The operations performed in old days, when circumcision and absence of the prepuce was a mark of disgrace, have no interest at the present day.

2. **Congenital Division of Prepuce.**—This has been carefully studied by J. L. Petit. The division may be found in the middle, or at either side. It is called complete or incomplete, accordingly as it extends quite up to the corona or only partially through the prepuce. This distinction is of some importance, as it is stated that it is only the complete division which will interfere with coitus and require a plastic operation or circumcision. Petit advises that when the edges are refreshed and united by sutures, no attempt should be made to unite the whole of the gap, otherwise a phimosis may be produced. Thus, it will be sufficient to unite about half, and before this is attempted, the surgeon must satisfy himself that the prepuce, when united, will be large enough and sufficiently free at its orifice to glide freely over the glans. If there is any doubt on this point, the flaps of the prepuce had better be removed by what will be tantamount to a circumcision.

3. **Shortness of the Frænum.**—This is not uncommon in a minor degree, which is of no importance. But when the frænum is very short and wide, inelastic and extending, it may be, quite up to the meatus, intercourse may be rendered very painful, and, if the frænum be ruptured, the bleeding may be smart and alarming. If, as has happened occasionally, the laceration extends into the meatus and the tissue of the glans, a really large quantity of blood may be lost. Another result of a very short frænum is that coitus is not only rendered painful but barren. When the penis is distended, the glans, curved downwards and

backwards as if by a bridle, will direct the seminal fluid against the walls of the vagina, instead of upon the os uteri.

Treatment.—A very short frænum should always be divided by a narrow bistoury and the artery tied with fine chromic gut. During the healing of the wound a small piece of dressing must be kept between the edges of the wound to ensure their cicatrising separately, and the prepuce must be kept in a state of paraphimosis. If the opening of the prepuce is not sufficiently free to admit readily of this, the prepuce must be slit up, or circumcision performed. The patient must be warned of the absolute necessity of abstaining from coitus until the parts are soundly healed, a point sometimes neglected in the newly married. Another result of a short frænum, which must always be remembered, is the fact, that if cracked or torn it may readily become the seat of chancre.

CHAPTER II.

SECTION I.

DILATATION OF THE PREPUCE.

THIS condition, known also as "ballooning of the prepuce," is met with chiefly in the newly born or in children as a result of a "pinhole prepuce." In the intervals between micturition there hangs down over the end of the penis, and continuous with the prepuce by a kind of peduncle, a thin cutaneous sac. When the child tries to pass water, this swells up into a thin-skinned sac the size of an owl's or bantam's egg. When micturition is finished some urine can still be squeezed out by the finger. This condition, if left, will of course lead to any of the sequelæ of phimosis above given and in an exaggerated form. Another condition to which it may lead from the retention of ammoniacal urine between the prepuce and the glans, is the formation of preputial calculi (p. 647).

Occasionally, this dilatation of the prepuce occurs not in early but in later life. Thus Dr. Brown (*Lancet*, May 21, 1870) records a case in which, owing to the contraction of the orifice of the prepuce from the cicatrisation of chancres, in a patient aged thirty-three, the prepuce was colossally expanded, and perforated in several places by fistulæ out of which the urine continually trickled.

SECTION II.

PREPUTIAL CALCULI.

A good account of this rare disorder is given by Lewin (*Berlin Klin. Woch.*, 1879, Bd. xiii. and xiv., SS. 177, 197), Kaufmann (*loc. supra cit.*, S. 207), and Demarquay (*Mal. Chir. du Pénis*, p. 138).

These calculi are met with more frequently in adults than in children, and most seldom in advanced age.[*] They are frequently numerous and facetted. Their size usually varies from that of a pea to that of a bean or plum. Occasionally the size has been much greater, reaching that of a pear, or even a man's fist. Their structure will be gathered from the account given below.

Production.—This varies. It will be seen that the origin of some commences in the bladder, of others on the spot; again, while some originate in urine salts, others arise in the preputial smegma. As a rule, a marked degree of phimosis is present.

i. **Preputial Calculi arising in the Smegma, by Impregnation of this with Lime Salts.**—These are concretions rather than calculi. The smegma, retained in thick greasy masses, becomes impregnated with lime salts, deposited from the drops of stagnant urine which remain behind in the prepuce after each act of micturition. According to Kaufmann, Zahn has experimentally proved this origin by keeping smegma in urine at the temperature of the body in an oven.

These concretions are soft and crumbly, without stratification or lamination. They consist, microscopically, of epithelium, cholesterin, and lime, with dead bacteria. According to Salkovosky, while chemical analysis showed the presence of fat, fatty acids, and lime salts, uric and phosphoric acids were wanting.

Truer urinary preputial calculi may originate in one of the following ways:—

ii. **Preputial Calculi arising in Urine which stagnates within the Prepuce.**—The nucleus here is thickened smegma, mucus aided by gravel, or even minute urinary calculi. These differ from the variety first described in their close resemblance to urinary calculi, their greater consistence and weight, and their lamination on section, especially at the periphery. According to Kaufmann, the chemical analysis of Zahn and others shows that the chief constituents are uric acid, phosphates of lime, and ammonio-magnesia, with traces of carbonic, oxalic, and sulphuric acids, the organic portion showing the "xantho-proteine reaction."

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[*] Dr. Foster, of Hitchin, records (*Lancet*, 1880, vol. i. p. 767) the case of a child, aged three, with congenital phimosis, from whom he removed a preputial phosphatic calculus, of about the size and shape of a sparrow's egg, weighing 50 gr.; another case is reported from Hertfordshire by Dr. Lloyd, of St. Albans (*Brit. Med. Journ.*, 1882, vol. ii. p. 580). The patient was aged thirty-five, and was suffering from retention. Eleven calculi, weighing 70 gr., were removed by circumcision. They consisted mainly of the triple phosphate of magnesium and ammonium and phosphate of lime. In this case, as in mine (*vide infra*), the patient was the father of children. Here also the condition had become much worse latterly. The Hunterian Museum contains a specimen presented by Mr. Vincent, of St. Bartholomew's Hospital, in which over 200 small calculi were removed from the prepuce of a very old man, the subject of congenital phimosis. They consisted of uric acid, urates and earthy phosphates.

For the formation of these considerable dilatation of a phimosed prepuce must be present, in which the retained urine can decompose. This accounts for the mixed composition of these calculi, partly urates and uric acid, and partly phosphates.

iii. **Vesical Calculi may, after passing along the Urethra, be arrested under a Phimosed Prepuce.**—There is also the possibility that a urethral calculus may, after lodging in the fossa navicularis, ulcerate through the floor of the urethra, and thus arrive within the prepuce (Kaufmann).

Preputial calculi, however formed, may occasionally make their way out by ulceration and formation of fistulæ.

The only case which has come under my notice was in a clerk, aged thirty-four, in 1881. He had been sent to the late Mr. Cooper Forster as a case of epithelioma of the penis, and at his request I admitted the patient into Guy's Hospital. The prepuce was in a state of tight phimosis, the aperture extremely contracted, with dense white glistening scar-tissue, evidently of long standing. The prepuce was red, thickened, and the size of a bantam's egg. On taking it between the fingers, a grating sensation was experienced, like that of small pebbles in a bag; a similar sound could be heard at the same time at some distance from the patient. A fine probe struck soft calculi at once. The urine constantly dribbled away, together with a disgustingly noisome discharge. There was dull aching in the part, worse when the patient moved about. When the patient strained to pass water, a small, jerky stream of urine came away. The phimosis was congenital. The patient was married and the father of three children; the condition had become much worse in the last two years. When the prepuce was slit up, eleven calculi, varying in size from that of a pea to a bean or a marble, were removed, with much sandy grit. The glans was irregular and disfigured, the chief part of its substance having been absorbed or ulcerated away. Circumcision was performed, and the patient made a good recovery. The calculi consisted chiefly of urates, especially the urate of ammonia, and triple phosphates. Many of them showed a nucleus of uric acid, showing that these had either come from the bladder or had arisen in urine stagnating within the prepuce.

In a paper of Mr. Croft's (*Clin. Soc. Trans.*, vol. xviii. p. 8), a good account is given of some preputial calculi removed from two natives of the Solomon Islands by Mr. Corney, the emigrant medical officer in Fiji. In the one case, twenty-two stones were removed; in the other, a single one, weighing 1 oz. 110 gr. The calculi consisted of the triple phosphate with a trace of urates. Congenital phimosis is stated to be very common amongst the natives of the Solomon Islands.

CHAPTER III.

INFLAMMATORY AFFECTIONS OF THE PENIS.

THESE may be acute or chronic. The former, which are much the most important, include, in addition to cellulitis, erysipelas, lymphangitis, cavernitis, or penitis, some of the different forms of balanitis, the acquired form of phimosis and paraphimosis, which have been described at p. 638 and 640, and herpes.

The same anatomical points mentioned at p. 544 together with the abundant blood-supply of the organ, and its pendent position, account for the readiness with which inflammatory lesions spread here as in the scrotum, while the existence, more deeply, of a strongly resisting fibrous sheath explains how some of these may be modified.

SECTION I.

CHRONIC ŒDEMA.

Before passing on to the acuter inflammatory affections a few words will be said of the chronic form of œdema. As a part of general anasarca this condition of the penis is often met with, but not to the same extent as in the scrotum (p. 545). It especially affects the prepuce and, more particularly, its under aspect, and the loose tissue about the frænum. The deformity produced is that of a knob or cap of œdematous skin which hangs over and beyond the glans, curving downwards by its own weight. The skin, stretched and devoid of rugæ, is smooth and glossy, and, at first, of its natural colour; after a while, owing to the trouble in micturition, inflammatory changes may set in.

The chief importance of this condition consists in the interference with micturition and the inflammatory changes which may set in. For a while, by squeezing the pad-like cap of prepuce the meatus can be uncovered, or at all events the preputial orifice sufficiently dilated to admit of a catheter being passed into the meatus. Great gentleness must be employed in these manipulations, as the vitality of the parts is lowered, and, macerated as the end of the prepuce is by urine remaining after micturition, abrasions, cracks, and inflammation readily follow.

Thus, it is better practice, when difficulty arises in passing a catheter, to make numerous punctures in the prepuce with a cataract needle, and after the fluid has drained away to keep the parts very dry with finely powdered boracic acid, and to prevent, as far as may be, a recurrence of the swelling by keeping the part well elevated against the abdominal wall.

If the use of punctures fail, the prepuce should be slit up, cocaine being used if the condition of the patient's heart and lungs does not admit of the use of general anæsthetics. In any operation on a prepuce the seat of chronic œdema, if a part of general anasarca, it is impossible to be too careful, even in making punctures, from the facility with which a low form of cellulitis and septicæmia may be added to the patient's troubles.

Another, but temporary, form of chronic œdema of the prepuce is seen after circumcision, if the part is allowed to hang down or if the patient get about too early. Much more rarely it is seen as a result of cicatrices about the root of the penis.

SECTION II.

BALANITIS. BALANO-POSTHITIS.

By **Balanitis** (βάλανος, an acorn, or the glans) is meant inflammation of the glans itself; by **Posthitis** (πόσθη, the prepuce) inflammation of the mucous surface of the foreskin. Balanitis may, of course, occur by itself, as when the prepuce is wanting, but posthitis is practically unknown by itself. I shall therefore consider these conditions together.

Balano-posthitis may be divided into acute and chronic varieties, of which the two most important forms, the venereal (usually from gonorrhœa) and the gouty, are good instances respectively. But several other varieties may be tabulated according to certain well-known causes of origin. There is no doubt that several of these varieties have been somewhat overlooked, being overshadowed by the frequency of the venereal variety. For the sake of space I shall only describe them briefly. But while the general idea prevalent is that acute balanitis, of venereal origin, is the only important one, the truth is that some of the more chronic varieties are exceedingly obstinate, and occurring, as they do, in patients no longer young may eventually lead to epithelioma.

The following **varieties of Balano-posthitis** deserve attention: **Venereal, catarrhal, croupous, diphtheritic, gouty, diabetic,** and **herpetic.**—Bókai and Kaufmann add the phlegmonous and gangrenous, which are rather instances of different degrees of inflammation. I shall consider the herpetic variety of balano-posthitis by itself, under the better known heading of Herpes.

(1) The **venereal** variety. **Causes.**—These often date to the contamination of gonorrhœa or soft chancres. I would, however, impress on my readers that an acute or sub-acute balano-posthitis does not always mean a venereal disease, even when the patient has exposed himself to this risk. Dirt (as in vulvitis) predisposes markedly to balanitis, and so does phimosis. Eating of unsuitable food—*e.g.*, a too rich diet—intercourse with a woman the subject of leucorrhœa, or one in whom the menstrual period has only just stopped, are all causes of balanitis. In venereal balano-posthitis the symptoms and course of the disease are often acute, though in patients who are no longer young, and whose habits predispose them to this disease, mere chafing during intercourse may bring about a simpler and more limited form of inflammation.

Symptoms.—In a well-marked case a sense of heat and itching in the glans is replaced by marked redness. The part is seen to be enlarged, tumid, dryer, and more glazed than usual. After some days the epithelium is seen to be exfoliating, and numerous shallow abrasions follow, while in cases where the sepsis runs higher as when the source of contamination is an acute gonorrhœa, or an inflamed chancre, these erosions may spread in depth and breadth, and become sloughing or perforating ulcers.

Diagnosis.—The distinction between the patches of erosions, due to balano-posthitis on the one hand, and the lesions of herpes and chancre on the other, is usually easy when the glans can be exposed. If, however, phimosis be present, much difficulty may arise. In order to tell whether the pus comes from the urethra or only from under the prepuce, an attempt should be made to withdraw the prepuce sufficiently to inspect the condition of the meatus, when the penis is gently squeezed, after all the discharge which has collected about the meatus has been wiped away with a dossil of lint, antiseptic wool, or a camel's-hair brush. If the prepuce is too long or swollen for the meatus to be exposed in this way, the discharge which has collected under the foreskin should be syringed away, and a small aural speculum passed down to the meatus. In some cases it will be impossible to decide until the phimosis is relieved. Where a urethritis is present, heat and soreness will probably be felt farther back along the urethra, and chordee and other symptoms—*e,g.*, profuser discharge and one more likely to be fœtid—may be present. In balanitis pain is chiefly complained of, as in gonorrhœa, during micturition, but an intelligent patient will speak of the heat and soreness being most troublesome at the end of the penis. A chancre may sometimes be told by the existence of a tender spot, it may be, near the frænum, or about the corona. If the sore is soft or mixed, consecutive sores will often form about the orifice of the prepuce. The state of the glands in the groin will often give useful information. Thus, while they may inflame and even suppurate in balanitis, this is much more likely to occur with soft or mixed chancres. The following case of M. Llangebert's shows that, even when no phimosis exists, the diagnosis may be so doubtful that no opinion should be given until the state of the glands has been watched. This surgeon was consulted for an obstinate balanitis in which the glans was extensively covered with red, irregular erosions, secreting a moderate amount of pus. It was looked upon as a non-specific balanitis, and the patient was encouraged to look forward to his marriage at the end of two months. It was noticed that the glands in the left groin were more swollen than is usually the case in balanitis. Two months later, and three days before his marriage, the patient reappeared to congratulate his surgeon on the success of his treatment, the application of silver nitrate having cured the balanitis in a week. Typical mucous patches were now present on the soft palate and the tonsils.

Treatment.—In most cases of venereal balano-posthitis the chief points are cleanliness and dryness. If the prepuce can be retracted, frequent washing the part with a mild solution of zinc sulphate or lead lotion, and keeping a piece of lint soaked in the same lotion between the glans and the prepuce, will suffice. If the prepuce cannot be retracted, the sac of the foreskin must be frequently washed out with tepid water, and then lead lotion injected; after a few days the patient, while injecting, should try and reduce the phimosis. If there be much œdema, free acupuncture should be employed. When the inflammation is very obstinate, painting with a solution of silver nitrate (gr. x – ℥j) is often very useful. When the inflammation runs high, and the risk of sloughing is feared, the prepuce should be slit up, and the treatment given at p. 653 adopted.

When balanitis frequently recurs, whatever be the cause, circumcision should be performed.

Catarrhal Balano-posthitis.—By this is meant a variety which, non-venereal in origin, may occur at any time of life in patients the subjects of phimosis. Thus, as already stated, it may occur in infants as a part of the imperfect separation of the glans of the prepuce. At this age, and again in boys and in older patients, it is both the smegma and a little retained urine which bring about the balanitis. When the glans is exposed, it and the inner surface of the prepuce are found red, irritable, and hyper-sensitive, and the papillæ on the corona are often hypertrophied. When the retained smegma, and the resulting muco-purulent discharge, with the disgusting, sour fœtid discharge, has all been cleared away, patches of erosion are often found upon the glans. These are only superficial and heal quickly, for, as a rule, they are due to the presence of decomposing masses of smegma. The hypertrophy of the papillæ along the corona sometimes leads to small acuminate papillomata, a warning of the graver condition which it only takes a longer time to bring about.

If the above condition is left until adolescence—and it is astonishing into what a condition some patients from over-delicacy will allow their genitals to get—the chief symptoms are itching, muco-purulent discharge, occasional hæmaturia, very painful erections, and priapism—these being much worse in warm weather, and easily brought about by the friction of the clothes in walking.

Treatment.—This will be on the same lines as that given at p. 653. Circumcision is generally required.

Croupous Balano-posthitis. — I have seen two cases of the "croupous" variety, if by this term, as used by Bókai, is meant cases in which, after circumcision, a whitish-grey membrane spread from the margin of the cut prepuce to the glans. It was easily removed, and as readily recurred. The patients were extremely fat children, and the weather at the time very hot. One application of nitric acid cured the balanitis.

The diphtheritic variety I have never seen. Kaufmann states that it may occur in contemporaneous throat-diphtheria, scarlet fever, measles, small-pox, or after circumcision, owing to infection from the mother (Bókai). It is characterised by a whitish or yellowish-grey membrane forming on the prepuce and glans, and is in no way to be distinguished from that which forms on the throat. It can only be removed with difficulty, and at the cost of a slight loss of tissue, hence the bleeding which follows. Kaufmann states that the course of circumcision-diphtheritis is like hospital-gangrene, the neighbouring tissues showing phlegmonous swelling, the inguinal glands being enlarged and tender, and high fever occurring.

Treatment.—From experience at the Berne Hospital Kaufmann strongly recommends the application of strong tincture of iodine, the prepuce being slit up if necessary.

Gouty Balano-posthitis.—I am in the habit of applying this term to some cases which I have met with in patients past middle life, who suffer from other evidence of lithiasis, and in whom this condition is much relieved and sometimes cured by anti-gouty remedies. In two of the five cases which I have seen Dupuytren's contraction was present, one of these being a medical man, aged fifty-eight, who was in the habit of driving much and living freely; the other was a foreman in an export wine business, where there was much packing of bottles in boxes and using hammers and other tools. Two of the other patients had dry scaly eczema behind the ears and in the inter-glutæal sulcus. The balano-posthitis takes the form of a redness or rawness, sometimes diffuse, sometimes in patches; usually the glans is more attacked than the prepuce, and, as far as I have seen, the corona and meatus escape. The affected surface may be raw and slightly moist, or dry and inclined to scale, as if like a dry eczema; and I should be inclined to look on the former as much the most difficult to cure. In that form which occurs in patches, the margins of these may be abruptly marked out with well-defined edges. I have been inclined to look upon this form of the disease as one of the minor forms of gout, one of those manifestations of the disease which, at the present day, have replaced the acute typical "great-toe gout" of the beginning of the century. I am convinced that the disease is of grave importance, as it may, by its persistence and the inflammatory changes it brings about, produce a phimosis, a condition to be looked upon as fraught with peril in patients of the time of life at which this form of balano-posthitis occurs. This was so in the case of the medical man mentioned above. He had married late in life, and was the father of three children. A phimosis had gradually appeared, and when the prepuce was partially retracted, reddish raw patches of superficial ulceration could be already seen on the glans beneath. In another patient, whose case is mentioned in the account of epithelioma of the penis (Fig. 85), the patient, a man of fifty-two, when he came under my care, had noticed, some years before, the development of "a rawness"; on this phimosis and epithelioma supervened.

Treatment.—This should be watchful and energetic. When the prepuce can be withdrawn cleanliness is always to be enforced. Where the patches are dry and scaly, the citrine ointments, those of the oleates of zinc or lead, or the ung. picis liquid., may be tried. In other cases a lotion of sod. bicarb. suits best. In every case attention must be paid to general points, such as getting rid of the patient's waste material, flushing out the kidneys regularly, the forbidding of sugar, sweet wines, rich food, and the limitation of butter, &c.

But when the disease persists, even though its course be so slow as to scarcely deserve the name of progress, the prepuce must be slit up, or the patient circumcised, and nitric acid carefully applied. When the patient is stout and elderly and the balanitis intractable, a suspicion of glycosuria should always arise—(1) as influencing the obstinacy of the case and the treatment (p. 658); (2) as bearing upon the propriety of circumcision (p. 658). If this last step should fail the patient should be seen at intervals, and removal of the glans advised as soon as the ulceration is confirmed, and while yet it is in a "pre-cancerous" condition (pp. 708, 725).

Since the above was written I find that Mr. Hutchinson has described, under the heading "Balanitis perstans" (*Archives of Surg.*, vol. ii. p. 18), a form of balanitis which may be the same as the above. The following is his account: "There is a very peculiar affection of the glans penis of which I have seen a few examples, but which, so far as I know, has never been described. From its chronic, indeed almost incurable, character, the name which I have suggested seems applicable. It occurs, I think, only in men past middle age. The glans shows abruptly margined map-like areas of a deep red colour and slightly moist, but not raised nor in any degree ulcerated. They remain for years together with no change excepting slow extension. The surfaces affected look slimy and glazed, and easily wrinkle like tissue-paper. A., gentleman, aged forty-five, affords a good example of this condition

He was unmarried, and there was nothing especial in the state of his health. Retraction of his prepuce disclosed almost the whole glans apparently in a state of acute, superficial inflammation, red and shining as if covered with moisture or with vaseline. Yet it was scarcely moist, and no secretion could be removed, nor were the appearances materially altered by wiping. On careful inspection it was seen that the red patch included the greater part of the glans, but was everywhere abruptly marginated. Its edge was more congested than the surface. However much wiped, the surface always remained bright and glistening. The corona was nowhere involved on the edge of the patch close to it. The opposed surface of the prepuce was in a precisely similar condition. The parts looked as if very irritable, but he declared that there was no itching whatever, and no soreness. If, however, the parts were rubbed roughly a peculiar aching was produced. The condition had been present for seven years, and persisted, or rather extended, in spite of the utmost cleanliness. It gave him no inconvenience, and 'were it not for the look of the thing and that it soiled his linen, he would not care anything about it.'" Another case is mentioned in a gentleman past middle life, married, and of most cleanly habits. The patches were abruptly mapped out, and always the same, red, crinkly, and glossy. He came to Mr. Hutchinson at intervals for more than a year, but treatment failed to cure him.

Diabetic Balanitis.—This disease is similar to that moist form of eczema which attacks the female genitals, but is met with less frequently. According to Kaufmann, it is never met with in the circumcised. The characters of this form of balanitis are velvety surfaces of the prepuce and glans with sensations of itching and burning. The colour is dark red, and the erosions are numerous, giving vent to a yellowish, foul, purulent discharge. The origin of these erosions has been ascribed by some to vesicles as in eczema, by others to sloughs after the formation of a series of minute boils. A fungus, showing mycelium spores in all forms of their development, has been found in the smegma and discharge of these cases.

Simon also, in a paper entitled "Balano-Postho-Mycosis" (*Intern. Medical Congress*, 1881), looks upon this fungus as characteristic of this form of balanitis, and states that he has never been able to find it in other varieties of balanitis. Friedrich is of opinion that the characteristic fungus is to be found, even when the amount of sugar present is very small, and

Beauvais and Kaposi go further, and refer to cases where the balanitis formed the only sign of diabetes. In the cases I have seen the patients are here, as in women with pruritus vulvæ and diabetes, stout and florid.

The balano-posthitis seems to be due to decomposition of the saccharine urine left between the glans and the prepuce thus keeping the parts moist, or retained in the sac of a phimosed prepuce.

Treatment.—Where the prepuce can be retracted, a restricted diet and small doses of opium or one of its alkaloids, aided, locally, by great cleanliness, washing the part frequently with a dilute boracic-acid lotion, and then drying it with a powder containing equal parts of zinc oxide and starch with a little salicylic acid added, will suffice.

Where this fails, or where an increasing phimosis exists, the question of circumcision will arise. This is never to be resorted to if it can be avoided, especially in diabetics who are bulky with flabby fat, enfeebled, and the subjects of lassitude or languor. It is well known how badly diabetic patients bear operative interference, how soon they collapse after comparatively trivial operations, and how liable any wounds are to sloughing and gangrene. Several cases have been recorded where a fatal result has followed circumcision in diabetic patients. The following case, recorded by Beauvais (*Gaz. des Hôp.*, 1874), shows, as an instance of the baneful influence of diabetes, the gangrenous character given to an otherwise harmless inflammation following circumcision. A man, aged thirty-four, was circumcised by Richet for phimosis and intense balano-posthitis. On the third day there was abundant hæmorrhage, on the fifth, erysipelatous swelling and threatening gangrene. The urine was then found to be markedly diabetic. Grave general symptoms followed, and the patient recovered after the skin of part of the penis and scrotum had sloughed. But with the advantages of antiseptics at the present day, in patients where the balanitis cannot be got at owing to an increasing phimosis, where the itching, irritation, &c., are extreme, the prepuce may be slit up, after the method given at p. 629, with every hope of a good result, if the patient previously submit to a restricted diet, aided, if need be, by small doses of some form of opium, and a course at Vichy or Carlsbad, as advised by Continental writers—*e.g.*, Englisch. This operation will be found to give better results than attempts at dilatation by special instruments or laminaria tents, this method being very liable to cause cracks and splits about the orifice of the prepuce.

Another reason which will justify our availing ourselves of antiseptics and resorting to circumcision, is the danger that the balanitis, if uncured, may pass on into epithelioma.

SECTION III.

HERPES PROGENITALIS, OR PREPUTIALIS.*

Under this name several distinct diseases have been included. To begin with, as herpes is now divided into **two main groups**—one, "herpes zoster," in which the vesicles represent an inflammation or eruption of the skin dependent on some central nervous disorder; the other, the "catarrhal herpes" of some writers, a group in which the herpetic eruption is of a more local origin, and allied to erythema, we may at once separate off **one rare variety of herpes progenitalis, in which the vesicles are part of a herpes zoster,** affecting the ilio-inguinal nerve. Such cases in no way differ from herpes zoster elsewhere. Their chief importance is the suspicion which their occurrence on such a site may beget in the mind of the patient or others that they are of venereal origin. In the case of married people this may cause great trouble.

It is to **the other group, herpes of more local origin, the so-called catarrhal herpes**—*i.e.*, the group containing H. labialis, and which from its course and natural history is placed by such leading dermatologists as Dr. Pye-Smith amongst the erythemata—that herpes progenitalis belongs. The relations of this disease to other skin diseases are uncertain. In its sudden origin in a red inflamed patch, seated superficially, and in its rapid course it is allied to the erythemata. In its occurrence and formation of vesicles close to the orifice of a mucous tract, and in its frequent recurrence, it is closely allied to herpes labialis. Like this disease, also, it is often symptomatic of other disturbances with deeper relations to the mucous tract, about the orifice of which the eruption is seated—viz., seminal emissions. It has little or no connection with eczema and its allies, nor can it be linked with zona, as it is not unilateral, and does not follow the course of any one nerve.†

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* As herpes may attack other parts besides the prepuce—*e.g.*, the glans—I prefer to use the first of these terms.

† I must with all deference differ from my colleague Dr. Pye-Smith in his

Course and Progress.—The outbreak of the disease may be preceded by prodromata, of which disturbance of the digestive tract or that of the nervous system which follows on a seminal emission or coitus are the most common.

The patient is usually one in the years of full sexual vigour. The disease commences in an itching or burning sensation, which is soon followed by a patch of erythema, on the inner surface of the prepuce—in my experience much more frequently on the fold just behind the corona—and next to this on the glans penis, and, more rarely, the cutaneous part of the prepuce, or the skin of the penis. The next stage is the appearance of a series of minute papules, which very quickly change into vesicles, and the serum speedily becoming turbid (from the friction of the parts and the presence of the smegma), pustules follow. Minute excoriations next appear, from the shrivelling of the vesicles, and these, as a rule, are healed in five days from the commencement of the attack.

The course above described is that of an uncomplicated attack. The amount of pain varies; sometimes it is only a tingling or itching, at others of a burning or aching character; but it may, as in a patient of mine, be severe enough to keep the patient awake at night. Occasionally, in addition to the local pains, there is much neuralgic suffering, referred to the branches of the lumbar and sacral nerves (Mauriac, *Herpés Neuralgique des Organ-génit.*, 1878, p. 49). Another complication met with in herpes in patients of poor vitality, or where the vesicles have been exposed to dirt, the irritation of sexual intercourse, caustics, &c., is sloughing, or even gangrene. In these cases, of course, the inguinal glands will become tender, and may suppurate.

A marked and very troublesome characteristic of herpes progenitalis is its tendency to recur obstinately, at intervals of two

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statement that another point of difference between H. preputialis and H. zoster is that the former "is unattended with pain." The pain (without any itching or pruritus) is severe enough to keep patients awake at night. I admit that it is less abiding, and that it does not leave behind it that terrible pain which may persist long after a H. zoster has healed. With reference to this point, however, it must be remembered that H. preputialis does not occur in the aged. Dr. Pye-Smith also states (*Medicine*, by Fagge and Pye-Smith, vol. ii.) that, like H. labialis, H. preputialis is "often symptomatic of deeper inflammation or stricture of the urethra, although it does not seem to be produced by a cystitis, and certainly does not follow inflammation of the kidney, as labial herpes does inflammation of the lung." Herpes labialis will follow, as is well known, on the passage of a catheter, or rather perhaps on the rigor or attack of vaso-motor spasm which accompanies the use of the instrument.

or three weeks or months, for a long period. "In a person who has once suffered from the affection, very slight causes, such as excessive eating or drinking, fatigue, disorder of the digestive organs, or sexual intercourse, are often sufficient to bring on an attack, especially if the patient has not suffered recently. After having recurred at intervals for several years, the attacks usually get less and less severe, until finally the tendency to the disease wears out, and the patient ceases to suffer from it, unless a fresh attack of venereal disease intervene, and, as it were, gives a new impulse to the disorder" (B. Hill).

In addition to this unexplained tendency to recurrence, the following points, which are also still obscure, deserve attention. What is is the relation of herpes progenitalis to venereal disease or sexual excitement? Are patients with this disease the subjects of any constitutional taint? I will take these questions together, as the cases which I have seen bear out my view that, while herpes progenitalis is very often preceded by some venereal affection, most frequently by a soft chancre or gonorrhœa, this is not always so, cases occurring in which there is no reason to doubt the patient's denial of venereal disease, or even of sexual intercourse, and that most of the patients are very liable to eczema, psoriasis, lumbago, lithiasis, and other evidence of the modified gout of the present day.

French writers on this subject—*e.g.*, M. Doyon (*De l'Herpés récidivant des parties génitales*, 1868) and M. Diday (*Thérap. des Malad. Vén.*, p. 346)—consider that this disease only occurs in patients of the "dartrous" diathesis, and that it is always preceded by some venereal affection, usually a soft chancre. Doyon states that the first attack of herpes usually appears about two or three weeks after the healing of a chancre or a gonorrhœa: Diday, that a cauterised chancre is by far the most powerful exciting cause of herpes.

Jullien (*Malad. Vénér.*, p. 1085) considers that venereal disease only plays the part of an occasional cause in the production of herpes, and that the true determining cause is to be looked for in a predisposing diathesis. In many cases the patients have suffered previously from some cutaneous disease—eczema, lichen, prurigo, psoriasis, pityriasis—and in a large proportion their skin will show, at the patient's visit, one of the above lesions in the course of development. According to the same writer, it is not uncommon for this variety of herpes to prove itself hereditary, and thus to occur in father and son, and in several brothers.

While, according to Jullien, such are the most powerful causes of herpes progenitalis, he adds that nothing is so likely to excite its recurrence as intemperance, stimulating diet, debauchery, prolonged walking, uncleanliness, venereal excitement, and especially coitus with different women. Every one has remarked, he adds, on the fact that habitual connection with the same woman is powerless to produce it—a fresh confirmation of the "law of acclimatisation," which also holds good with regard to urethral discharges.

To take, finally, the opinions of two English authorities. The late Mr. Berkeley Hill (*Syphilis*, p. 593) wrote: "We cannot speak so decidedly as do French authors concerning the necessity of some preceding venereal disease; indeed, we have seen herpes in one or two patients who denied ever having had sexual intercourse. We have observed that herpetic patients are either gouty or of the lymphatic temperament. By 'gouty' we do not mean only sufferers from ordinary gout, but persons who have relations who suffer from gout, and who themselves are liable to eczema, neuralgia, and other affections common in gouty people."

Mr. Hutchinson (*Syphilis*, p. 7) speaks thus of the relation of herpes to "true syphilis." "Herpetic vesicles may occur on the genitals of either sex quite independently of any venereal cause, and if they have occurred once they are very prone to occur again. They are, I think, seldom or never seen before puberty, and in those liable to them they often appear to follow directly on noctural emissions or sexual intercourse. Their relationship to syphilis is very peculiar and often very puzzling. It would appear that they are liable to follow on both kinds of local sores, the non-infecting as well as the infecting one. And although I have admitted that those who have never suffered from syphilis are liable to recurrent herpes, yet it is certain that those who have so suffered are infinitely more prone to it. In syphilitic subjects, further, herpes is often much more severe than in others. Its sores may last longer and become much larger than they would in others, or some of the vesicles may heal and others may persist, and thus it may become by no means easy to distinguish an herpetic sore from a non-indurated chancre. Since it very frequently follows intercourse the patient will often give a misleading history. There is yet another fallacy which occasionally occurs, for, in the careless, the existence of partly healed herpes may facilitate the implantation of the syphilitic virus, and thus a true chancre, or a whole group of chancres, may follow on what was, in the first instance, herpes."

Diagnosis.—If seen during its vesicular stage and without complications, herpes progenitalis is not likely to be taken for any other disorder. If, however, owing to irritation from dirt, carelessness, caustics, or from the bad health of the patient, inflammation and suppuration have followed, it may not be easy to distinguish it from the following: (1) **Balano-posthitis.**—Here, as in all cases of difficulty, the presence of a single surviving vesicle will be of great assistance. This failing, the chief points will be the presence of segments of minute circles pointing to the original herpetic vesicles; again, the loss of substance in balano-posthitis, in addition to not beginning in any such regular shapes, is much more superficial—*i.e.*, more of an erosion than an ulceration.

(2) **Soft chancres** may usually be told by their greater depth, more precipitous edges, and instead of being grouped close together, as in the case of herpes, they are nearly always more widely separated. Again, in soft chancre, arising as this does from impure coitus, the presence of a bubo will be the rule, in herpes the exception.

In the diagnosis between inflamed herpes and (3) a **syphilitic chancre**, also inflamed and irritated, the following points must be remembered—viz., the presence of induration, the existence of multiple, amygdaloid, indolent glands, and, after a time, the evidence of early secondary syphilis. The following fallacies must be remembered, one of which has been already given. The herpetic eruption may furnish the breach of surface through which the syphilitic virus gains entrance into the system, in which case, of course, there may be no change in the part until the period of incubation has elapsed. Again, "herpes may appear at a spot where the syphilitic poison has been previously absorbed, and if the appearance of the initial lesion coincide with that of the herpes, the spots of the latter may become indurated, forming the so-called 'herpetiform chancre'" (B. Hill).

Treatment.—The two chief points are, to heal the lesions, and to prevent their recurrence. The first is very easy of attainment in uncomplicated cases. Scrupulous cleanliness, frequent drying with a powder of starch and zinc oxide, boracic acid, or the one given at p. 658, together with a clean bit of lint often renewed between the glans and prepuce, is all that is needed locally. If the lesions be inflamed, the treatment must be on the same lines as those given at p. 639 for inflamed phimosis.

The treatment of the tendency to recurrence is a very different matter, and is often most disappointing. Any tendency to lithiasis and modified gout is to be treated according to the directions given at p. 295. Regular habits are of course necessary. Mr. B. Hill stated that when the approach of an attack of herpes is announced by symptoms of dyspepsia, a smart cholagogue purge, followed by salines for two or three days, will sometimes ward off the attack, but, as he adds, this premonition is often wanting. I have found, in two cases, the advice of the same surgeon, that the patient should use an astringent lotion in the hope of hardening the mucous membrane, beneficial. Where seminal emissions precede the herpes, these must be treated on the lines already fully gone into at pp. 466, 470.

Two remedies have been recommended as certainly preventive of recurrences. One is arsenic. Mr. Hutchinson, speaking of the recurrence of herpes labialis and herpes of the genitals, writes (*Brit. Med. Journ.*, 1887, vol. ii. p. 229): "Permit me here to make a remarkable therapeutic assertion. I venture it after careful and extensive observation. It is this, that in recurring cases the one remedy which will stop the tendency is arsenic. I know of no other, and I have the utmost confidence in this." Kaufmann (*loc. supra cit.*, S. 237) mentions a very obstinate case of herpes progenitalis in a patient aged forty, which recurred frequently, with premonitory excruciating lumbago, nocturnal emissions, and the localised sensation of pricking and burning, followed in its turn by the outbreak of vesicles. Here treatment by electricity, cold-water cure, quinine, arsenic, and potassium iodide, persisted in most steadily, had ended in failure. The patient declined circumcision.

This last step has been recommended as equally certain by Kaufmann. He seems to me to base this recommendation mainly on the results of a case of Verneuil's. The patient, aged forty-one, suffered from inveterately relapsing herpes. The prepuce was very sensitive. Acute pain, "spermatorrhœa," and general severe neurasthenia ensued. A cure resulted after circumcision. The prepuce showed a plexus of tangled nerve filaments, uniformly thickened, so that the nerves at their periphery were as large as those of the main branches. To this Verneuil gave the name of "neurome cylindrique plexiforme." With regard to circumcision, Mr. B. Hill wrote: "We have adopted this measure in a few instances, but without success, for although the prepuce had been formerly the seat of the eruption, the vesicles appeared elsewhere after its removal."

SECTION IV.

CUTANEOUS DISEASES OF THE PENIS.

I have alluded to lupus and eczema here as they commence in and usually only affect the skin of the penis,* while herpes attacks the glans also. There are, of course, other affections—*e.g.*, phtheiriasis and scabies—which may extend on to the penis from elsewhere.

Ordinary lupus very rarely attacks the genitals in either sex. I have twice seen very severe lupus of the female genitals, but only once a patch on the penis in a young adult, whose face and nose had been extensively attacked. Mr. Hutchinson (*Arch. of Surg.*, vol. ii. p. 17) explains this rareness of lupus on the genitals on the ground that it is a disease which is chiefly seen on parts exposed to the influence of changes of temperature, and is thus rarely seen on parts which are constantly kept warm by the clothes. In one case, almost the only one in which he ever witnessed such a condition, he performed circumcision in order to rid the patient of a prepuce affected by lupus. The patient was a young boy in whom lupus developed itself as an acute inflammatory eruption in large patches over the face, limbs, and body. The condition was that of non-ulcerating lupus. Amongst the parts attacked were the lobule of the right ear and the prepuce. The latter was much enlarged by the lupus growth. It was removed by an ordinary circumcision, and the parts healed well and remained sound. Mr. Hutchinson explains the affection of the penis here by "the extraordinary vigour of infective activity which the disease showed in the first stage, aided probably by the youth of the patient."

The same authority (*ibidem*) gives two cases of "syphilitic lupoid" affection of the glans. In one case the disease took the form of yellow-brown "lupoid" patches; in the other, that of a "tuberculo-lupoid" eruption, appearing in smooth, brown patches, which became confluent. In each case the affection showed a remarkable tendency to relapse. In each case specifics in various forms, and in full doses, were tried, together with ointments containing iodoform and mercury, and on several occasions liberal cauterisation with the acid nitrate of mercury. Mr. Hutchinson states that he has seen many other examples of "syphilitic lupoid" affections of the glans penis, and that he has generally found the disease far more difficult to cure than on the skin itself. I have referred here to this intractableness, as I shall allude to it again under the heading of Epithelioma.

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* The so-called "syphilitic lupoid" affection may attack the glans.

Eczema.—I only refer to this disease here, as I have twice seen it in men past middle life, affecting the inner third of the groin and the root of the penis. Both the patients were very stout, and the mischief was stated to have crept on to the penis from the groin. Thus it might have begun as an intertrigo. When I saw the cases, however, the affected surface was quite dry in the centre, and glazed, with a reddish-brown, scaly area of dermatitis around. Both the cases were surgical out-patients. In each case œdema of the penis existed, and when one of them returned after a long interval the sore had become epitheliomatous, and the groin glands were involved.

In the case of a patient in Guy's Hospital, under the care of the late Dr. Moxon, I was asked to circumcise a patient, a young lad, on account of the interference with micturition which a prepuce, the seat of characteristic leprosy nodules and phimosis, was causing. The face in this case showed well-marked *leontiasis.* The wound healed well. The nodules in the prepuce contained the *bacillus leprosæ.*

Dr. Beaven Rake, of Trinidad ("The Value of Surgery in Leprosy," *St. Louis Med. and Surg. Journ.*, April 1893), has performed circumcision sixteen times, usually for "phimosis, due to tuberculation of the prepuce. The incisions, though close to or through tuberculated tissue, healed rapidly."

CHAPTER IV.

ACUTE INFLAMMATORY AFFECTIONS. ACUTE LYMPHANGITIS. ERYSIPELAS. CELLULITIS.

I HAVE spoken at pp. 545 of the anatomical conditions which here, as in the scrotum, predispose to diffuse inflammation and sloughing. The chief importance of the above affections is the readiness with which they may pass into gangrene. As this lesion, however, begins in some cases as gangrene of the dry form, and without any preceding inflammatory affections, I have treated it by itself (p. 671).

Lymphangitis.—According to Demarquay, inflammation of the lymphatics of the penis may occur in **two forms**—(1) Lymphangitis limited to one trunk, and showing itself in the form of a single cord; and (2) Lymphangitis of a more diffuse character, when the smaller lymphatics are affected in the form of a network.

(1) **Inflammation of one Lymphatic Trunk.**—This is not uncommon in out-patient practice as a complication of acute phimosis from gonorrhœa. On the dorsum of the penis, and sometimes even in the thickness of the prepuce, a hard cord can be felt rolling between the finger, and, to use the words of a French writer, giving to the finger the feel of a vas deferens in the tissues. It may be accompanied by much œdema, inflammation, and pyrexia. It usually occurs in young and plethoric subjects.

Demarquay points out that this form of lymphangitis may easily be confused with phlebitis. He gives the following as diagnostic points: (1) The vein is larger. (2) It is exactly in the middle line, and, as it lies slightly in a groove between the corpora cavernosa, it is impossible to get the finger completely round it, as can be done with an enlarged lymphatic. (3) The dorsal vein, if traced upwards, dips under the pubes, while a lymphatic, which does not lie so exactly in the middle line, passes away to one side, superficially, to join the glands in the groin.

(2) **Lymphangitis of a more diffuse character**, affecting the smaller lymphatics in the form of a network.—According to Demarquay (*loc. supra cit.*, p. 178) this form produces a peculiar serous infiltration of the prepuce, gelatiniform in character. In other cases it gives rise to small, red, painful nodules, which suppurate, and give rise to troublesomely persistent fistulæ. Like the other form of lymphangitis, it usually dates to gonorrhœa. It generally attacks the lymphatics in the locse tissue of the fold behind the corona.

Treatment.—Elevation of the organ, rest in bed, lead-lotion and saline purges will usually give speedy relief. Any such complication as gonorrhœa or soft chancre, must, of course, be treated. According to Demarquay, the superficial fistulæ which may result from the more diffuse form of lymphangitis, are only to be cured by excision of the affected area of skin.

Erysipelas.—This usually reaches the penis as part of a similar inflammation of other regions—*e.g.*, the scrotum, lower part of the abdomen, or groin. It was not very uncommon in former days of inferior hospital hygiene, after the operation of castration, in cases of perinæal abscess, ruptured urethra, &c. In other instances it starts on the penis itself, as the result of leech bites, or too energetic cauterisation of an unhealthy sore, and, sometimes, in the children of the poor, who are not kept sufficiently quiet after circumcision. In these cases the erysipelas may take the form of E. ambulans or errans, and prove too much for the defective vitality of some of these patients. The possible patency of a processus funiculo-vaginalis is, under these circumstances, another risk. A danger which erysipelas here shares with that of the scrotum is its liability to pass into gangrene. The treatment is the same as that given at p. 548.

Cellulitis.—It is well to remember that, from a clinical point of view, cellulitis and abscess, like erysipelas, fall into **two distinct classes**—one, in which the inflammation arises in some cause quite independent of the urethra; the other, where the mischief starting the inflammation arises in this canal.

As instances of the former, we have cellulitis, and perhaps abscess, set up by venereal trouble, balanitis, acute phimosis, &c. Other illustrations are injuries to the perinæum without injuries to the canal, and tubercular or pyæmic abscesses.

As instances of the second group, where the inflammation—cellulitis and abscess—is dependent on some diseased state of the urethra, the following must be remembered: Acute gonorrhœa, the mischief here starting in the wall of the urethra, in one of the urethral lacunæ or mucous glands, or in the glands of Cowper. In such cases the acute course, the history of neglect or, more rarely, of unwise injections, the swollen œdematous penis, often in a state of phimosis, and curved, it may be, upwards or downwards, are familiar to any surgeon who has seen much of out-patients. Such patients are often admitted for retention of urine. After a few days the swelling increases at one spot, on the ventral aspect of the penis, or, in the case of Cowper's glands, in the perinæum, calling for the early incision of an abscess.* Other instances of inflammation connected at its commencement with the urethra are cellulitis, and perhaps abscess, following on injury to the urethra, accidental or surgical, those connected with stricture or obstruction to the urethra from calculus, and operations for their relief.

It must be sufficient in a work like this, which deals only with "Diseases of the Male Organs of Generation," to enumerate the above chief causes of cellulitis and abscess of the penis. Several of them will be referred to in the next section as causes of deeper-seated inflammation also.

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* Such glandular abscesses do not, of course, because connected by their situation and ducts with the urethra, necessarily communicate with it.

CHAPTER V.

INFLAMMATION OF THE ERECTILE TISSUES OF THE PENIS. CAVERNITIS. PENITIS. GANGRENE.

SECTION I.

CAVERNITIS. PENITIS.

BY some writers a distinction is made between cavernitis and penitis, the former being used for inflammation of some part of the erectile tissues of the penis, whether corpus cavernosum or corpus spongiosum, and penitis for inflammation of the erectile tissues as a whole.

I have alluded to these inflammations of the erectile tissues separately on account of the grave danger that they entail of pyæmia.

A **distinction** may be made according as the inflammation arises from the corpora spongiosum, especially the bulb, or in one of the corpora cavernosa. While described here as a separate disease, it will not be forgotten that inflammation of the erectile tissue of the penis is often complicated with erysipelas, cellulitis, and gangrene.

The following are amongst the most likely causes:

Usually there is some injury or inflammation of the erectile tissue, especially that of the corpus spongiosum or bulb. Thus, a contusion of the urethra received in riding, an acute gonorrhœa with sloughing balanitis, or suppuration of Cowper's glands, may all lead to cavernitis, either by causing septic thrombosis directly in the cavernous tissue, or, through phlebitis of the dorsal vein, to septic thrombosis in the prostatic plexus, and so to secondary septic thrombi in the penis itself.

In one case recorded by Demarquay, sexual excesses repeated in a short time in a patient, aged forty-six, of drunken habits, led to cavernitis of the erectile tissue of the bulb, gangrene, and fatal septicæmia.

As in Mr. Gay's case, thrombosis of the iliac veins may be the starting-point.

Cavernitis may be diffuse or localised. Though, from the structure of the cavernous tissue, the latter form of suppuration would have appeared impossible, it seems from Klebs that extension of inflammation may be prevented by localised thickening of the erectile tissue.

The **chief symptoms** are swelling of the penis, the skin of which is red and œdematous, constant priapism, at first unexplained and painless, with pyrexia and rigors. A portion of the erectile tissue may be found, at first, to be unduly firm and tense; later on, this is replaced by softening, and perhaps by emphysematous crackling.

Unless the case is treated early, pyæmia is a terribly frequent **complication,** evidence of broncho-pneumonia or septic pleurisy appearing, with jaundice, delirium, and hiccough.

Treatment.—This must be energetic. Where appropriate treatment of some injury to the urethra, sloughing sore, or urethral abscess has failed, and multiple incisions into the skin of the penis have not relieved the pyrexia and grave symptoms, the state of the constituents of the penis itself must be carefully examined with the aid of ether or A.C.E. mixture. Any hard or fluctuating patch in the erectile tissue must be freely incised, any sloughing or gangrenous tissue snipped away, and the parts cleansed thoroughly. For this purpose Kaufmann recommends the strong tincture of iodine. There is no need to dread hæmorrhage. Plenty of Spencer Wells's forceps should be at hand, and as many of these as are needed may be safely left *in situ*. A hot boracic-acid dressing, frequently renewed, with iodoform, will be useful, the sloughy parts being painted every six or eight hours with the strong tincture of iodine.

SECTION II.

GANGRENE.

The same predisposing anatomical conditions exist here as in the case of the scrotum, with the addition, that in this organ we have, combined, loose cellular tissue, very vascular and easily overloaded with inflammatory products, and, at the same time, firm, fibrous envelopes resisting over-distension.

The moist **form** of gangrene is more frequently met with than the dry, inasmuch as gangrene of the penis is usually preceded by acute inflammation. The part attacked, and lost, varies considerably. When the term gangrene of the penis is used an attempt should be made to specify the part meant. Thus it may be limited to the skin, especially the prepuce, as is most commonly the case. In worse cases the whole cutaneous envelope perishes, and in severer cases the skin over the lower part of the abdomen, groins, and scrotum may also be lost. As will have been gathered from the account of the condition known as "cavernitis," the erectile tissues, the corpus spongiosum and one of the corpora cavernosa may be the parts affected by the gangrene, with or without the skin being implicated also. Finally, the most extreme condition, gangrene of the entire organ, or "sphacelus" of the penis has been observed in several cases.

Causes.—Demarquay divides these first into **local** and **general.** While the first are the more common, in many cases the question is not a simple one, both local and general influences having to be considered. The **general** are divided by the same writer into *predisposing* and *determining.* Of the *predisposing* the chief are—(1) Age. Though most common in the adult, gangrene of the penis has been met with in children* (as after exanthems), and in old age. (2) Constitution. While a plethoric condition is one in which fever is likely to run high, it seems to me that a debilitated condition from drink and debauchery, with poor vitality, is of much greater influence as a cause.

Amongst the *determining* or *exciting* general causes, the specific fevers are the most important etiologically—*e.g.*, small-pox, typhoid fever, and, in former days, typhus. A good instance of the last was recorded by Mr. Partridge (*Path. Soc. Trans.*, vol. xvi. p. 192). A man, aged forty, of temperate habits and healthy constitution, was attacked with typhus fever, became delirious and remained unconscious for more than a week. When first seen by a medical man, the whole penis, as far as its root, was gangrenous with a distinct line of demarcation. The mortified part was black and dried up, like the empty finger of an old black kid glove. The urine dribbled from an aperture between the gangrenous and sound parts. In a few days the mortified part dropped off. The man recovered. Dr. Murchison mentioned on this occasion that he had met with several cases of mortification of the genitals accompanying typhus fever.*

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* From my experience, this condition—a gangrenous noma—is much more commonly seen in the genitals of little girls, perhaps from the greater frequency of sepsis from discharges here. Dr. A. Marcy records (*Philad. Med. News*, 1884, vol. xlv. p. 456) the case of a child, aged two weeks, who looked "fine and healthy," in which gangrene of the scrotum, and, in part, the penis also, occurred without any known cause.

Boyer drew attention to typhoid fever as a cause (*Traité des Mal. Chir.*). In one case œdema of the prepuce was noticed on the fifteenth day of the fever, ending in gangrene of the prepuce, glans, and part of the penis. No balanitis or gonorrhœa was present. In a second case, also in a young adult, the premonitory œdema appeared in the second week of the fever. In a third (*Allg. Med. Centr. Zeit.*, Jan. 7, 1880), a gangrenous patch was noticed on the prepuce in a patient convalescent from typhoid fever. Two-thirds of the penis became involved and were detached in fourteen days.

Rostan (*Gaz. des Hôp.*, 1853) reports a case of gangrene of the prepuce in a patient convalescent from small-pox.

Intermittent fever has been noticed as a cause in several cases. The following is given by Boyer. A patient who had spent fourteen months in Senegal was sent home with intermittent fever and hepatitis; when admitted into the hospital of S. Maudrier there was œdema of the prepuce and penis, with discharge of bloody fluid, but no gonorrhœa. Three days later the anterior part of the prepuce was attacked with gangrene. The patient recovered with loss of his prepuce and much of the glans. A similar case is recorded by Gautier (*Un. Méd. du Nord-Est.* 1882, p. 286) in a man, aged fifty-one, with intermittent fever. Here the œdema was followed by erysipelatous redness, and this by gangrene of the skin from the prepuce up to the trunk. Two cases occurring in the course of malarial fever and ending, one in gangrene of the scrotum, the other in gangrene of the scrotum and penis, are given in the *Centr. f. Chir.*, Bd. viii. 1874.

Mr. Gay (*Path. Soc. Trans.*, vol. xxx. p. 233) records a most interesting case in which gangrene of the entire corpora

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* The best account of gangrene in fevers with which I am acquainted is that given by Dr. Keen, of Philadelphia, in his *Toner Lecture* for 1876 on the "Surgical Complications and Sequelæ of Fevers." According to this well-known writer's view, such cases of gangrene may be divided into those in which a clot can, and those in which one cannot, be discovered in the large vessels. The genitals fall under the second head, though Dr. Keen believes that coagulation occurring in the capillaries is here the cause of the gangrene. He looks on the genitals as parts characterised by the number of small branches which supply them, by their distance from the heart, by the readiness with which they lose their heat, and the fact that they are often irritated by local discharges. In both classes the following three causes exist and vary, *inter se*, in producing the result—viz.: (1) Alteration in the blood; (2) the weakening of the heart; and (3) mechanical difficulties in carrying on the circulation, especially in distant parts.

Inflammation of the penis, cavernitis, penitis, septic phlebitis of the dorsal vein, and extravasation of putrid urine,* are other causes.

Réclus has met with one case in which gangrene of the glans and the anterior part of the penis occurred in an old man whose dorsal artery was markedly affected with atheroma.

Mr. Hutchinson (*Arch. Surg.*, vol. ii. p. 364) mentions a very interesting case of spontaneous gangrene of the penis in a patient who, nearly thirty years before, had lost both legs from gangrene due to exposure to cold. The man was sixty-six when the entire penis passed into gangrene; he was at the same time confined to bed by sub-acute bronchitis. Mr. Hutchinson believes that the prolonged exposure to cold inflicted permanent damage upon the nutritional vigour of the tissues generally, from which they never wholly recovered.

Finally there are cases in which no cause, local or general, can be made out. Such is the case of "gangrène foudroyante" given by Prof. Fournier (*Sem. Méd.*, Dec. 6, 1883) in which the coverings of the penis and scrotum perished, in a young man, without any known cause. In another case "Gangrène spontanée foudroyante" (M. Oltramare, *Rev. Méd. de la Suisse romande*, 1888, t. viii. p. 219), delirium tremens and alcoholism perhaps explained a very similar result in a man aged thirty-seven. M. Troisfontaines (*Ann. des Mal. des Organ. Gén.-urin.*, 1888, t. vi. p. 428) records a case in which gangrene attacked the skin and the body of the penis in a young and healthy man without any known cause.

Symptoms and Course.—These must vary very much owing to the great variety of causes in which gangrene of the penis may start. Of these causes some—*e.g.*, traumatisms, acute septic inflammations, and those arising in specific fevers—are most likely to cause deep gangrene of the organ. Others—paraphimosis, lymphangitis, and strangulation by foreign bodies—are usually followed by superficial destruction only. Demarquay divides the disease into **three stages**:—(1) the period of invasion; (2) that in which the gangrene is progressing; and (3) that in which it is being separated. The first stage is only that of violent inflammation. The second, sometimes preceded by the formation of vesicles, announces the actual appearance of eschars. These vary, being sometimes dry and shrivelled, at others badly limited, soft, and loaded with fluids. The third period usually commences about the tenth day, and is characterised by the appearance round the sloughs of a reddish line.

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* Here not only the interference with the circulation, but the possible infiltration of the urine have to be remembered.

The following are the chief **complications**: (1) Pyæmia. (2) Hæmorrhage. (3) Opening of the urethra.

Prognosis.—Here both the life of the patient and the amount of damage to the organ have to be considered. The deeper the inflammation extends, the more the cavernous tissue, or the plexuses out of reach—*e.g.*, the prostatic—are affected, the older the patient, the worse will be the prognosis; and here the presence of albumen or of sugar will have to be taken into account.

Treatment.—The following **three points** will have to be remembered: (1) That of prevention when the mischief is threatening. (2) That of arresting it when it has begun. (3) The question of removal of gangrenous parts and the after-treatment. It is during this stage that the complications of hæmorrhage and of an opening into the urethra have to be considered.

(1) That of **prevention.** As instances of the precautions to be taken here, the slitting up of a phimosis, the energetic treatment of any sloughing or of a balanitis, the relief of a paraphimosis, and the removal of any foreign body, must be remembered. Another point of much importance from whatever quarter the gangrene is threatening, is to relieve the stress of the circulation by scarification, or sufficient incisions. Maintenance of the organ in an elevated position, the use of boracic-acid lotion, hot or cold, as preferred, and frequently renewed, with purging, and absolute rest, will suggest themselves at once.

(2) Where the gangrene has declared itself, the chief points, to **prevent its spreading**, are to keep the part in as even a temperature and as aseptic a state as possible, and to maintain the patient's strength. If sufficiently free incisions have been made to relieve tension and to give vent to inflammatory products, the continued use of iodoform and some aseptic wool will probably be better than the frequent exposure of the part entailed by the renewal of hot lotions (*e.g.*, boracic acid), and, still more, of poultices. While, later on, the removal of gangrenous patches is always to be hastened by the use of scissors, &c., the adoption of this step before any line of demarcation has occurred is very risky, owing to the probable condition of the parts through which the division must be made. In a very few cases—*e.g.*, where the mischief is clearly limited to the prepuce—removal may be practised in this

stage. In some cases, where micturition is much interfered with and the passage of catheters is necessarily difficult, it will be well to open the urethra in the perinæum, a step that will always be taken, for the sake of drainage, where the gangrene is associated with stricture, abscess, or any such condition which may expose the patient to the risks of extravasations of unhealthy urine.

In the third stage.—The chief indication, now, is to hasten the detachment of sloughs by scissors and the use of chlorinated lime poultices, to promote the healing of granulating surfaces by the use of stimulating applications such as turpentine diluted with carbolic oil, or tinct. iodi. The risk of hæmorrhage must be remembered in this and the preceding stage. Plastic surgery may be needed later on, for the closure of fistulæ, or the providing of a better covering.

CHAPTER VI.

SECTION I.

CHRONIC INDURATION OF THE ERECTILE TISSUE OF THE PENIS.

CHRONIC induration may be met with in the sheaths and erectile tissue of the corpora cavernosa and corpus spongiosum. The variety which occurs spontaneously is met with in the former bodies alone. The **causes** vary.

(1) Gout is probably much the most common. The localised indurations are here met with, usually on the sides, sometimes on the dorsum of the penis. They are generally met with behind the glans and in front of the pubes, much more rarely in the crura. I am not aware of any exact account of the morbid anatomy of this condition, as it has not been investigated in the dead body. According to M. Tuffier (*vide infra*), M. Leloir examined one of these nodules, which had been removed by M. Verneuil. Microscopically it resembled keloid, a fibrous network being present like that of scars, with few vessels, and islets of embryonic cells tending to fibrous transformation.

Cruveilhier (*Anat. Path.*, t. iii. p. 594) states that he has been consulted in three cases in which one of the corpora cavernosa had undergone fibrous change. He does not appear to have been able to follow them up after death.

In one variety this change takes the part of a tough, inelastic thickening, with distinct and well-defined margins, which contrast sharply with the adjacent unaltered erectile tissue. To the touch the induration may take the shape of a rounded cord, or a band encircling one corpus cavernosum more or less completely, and at a right angle to the axis of the penis; in other cases they resemble a small pea-like mass, or a plate of varying size. These are more common than the bands. Tuffier (*Ann. des Mal. des Organ. Gén.-urin.*, 1885, p. 401), states that the thickest of these bodies are met with in the septum. They form quite insidiously, without apparent cause, and if assigned by the patient to injury, this explanation is usually inadequate. They are first noticed by accident, or from slight pain or alteration in the direction of the organ during erection, which, when the lesions exist on one side (the commonest condition) is curved towards that side.

These bodies are probably fibrous thickenings of the sheath or septum, and, by continuity, of the erectile tissue. Thus it comes about that the naturally delicate trabeculæ which limit the blood-spaces become thickened and stiffened, and thus the areolæ themselves unable to expand. The condition is unknown before 40 or 45, and is probably analogous to the thickening and toughening of the palmar fascia which goes by the name of Dupuytren's contraction, and which we recognise as partly due to habitual, though it may be "incomplete,"* gout, and partly to some constant irritation. Thus they may be met with "in both the penis and the hands of the same gouty person" (Kirby, *Dub. Med. Journ.*, 1850; Sir J. Paget, *Studies of Old Case-Books*, p. 18). Sir James draws attention to the two following "conditions which should be noted. The indurations of the palmar fascia do not, so far as I know, ever become bony or calcareous as those of the sheath or septum of the corpora cavernosa sometimes do, when they form substances rather like those which German writers have classed among *Exercir-knochen*. The changes in this sheath, also, may be found in some who have no evidence of being gouty; and they sometimes form quite rapidly, so that, within a few days, the thickening becomes sufficient to give an extreme curvature to the penis in erection."

Kirby (*ibid.*) was one of the first to notice this condition, and to associate it with gout. He gives one case in which the fibrous change was extremely marked. The patient was fifty; for many years he had suffered from gout in the joints, and for two years had noticed a diminution in size of the penis, a diminution which was increasing. It was stated that during venereal excitement the glans did not present more than half its ordinary size. The penis was also so curved as to interfere with coitus. The corpora cavernosa were extraordinarily firm, while the corpus spongiosum preserved its natural flexibility. The suspensory ligament was replaced by a rigid body, which extended along the dorsum of the organ up to the corona, where it gradually blended with the subjacent structures. At the attachment of this ligament to the pubes small pisiform bodies were embedded in it. Below, the penis was enveloped in a sheath apparently cartilaginous. Similar but smaller plates were found on the sides of the organ, incorporated with its fibrous tissue. There was no interference with micturition. The condition was painless, save during erection.

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* The epithet has been explained at p. 655.

In the five cases which I have seen, two had dry scaly eczema behind the ears, one Dupuytren's contraction, one gouty balanitis. Three of the patients admitted living very freely. Four of the five presented the fine, massive, well-worn teeth which are associated by some writers with gout.

(2) In other cases a similar induration of the corpora cavernosa is produced also without strain or injury, that is, spontaneously, in patients of **gouty** constitution. Sir P. Hewitt (*Trans. Clin. Soc.*, vol. vi. p. xl.) attributed this to **thrombosis** of the venous spaces of the corpora cavernosa. The following is one of the two cases recorded :—" A gentleman, aged fifty-eight, had shown in various ways a tendency to gout; in this case, too, the trouble was accidentally discovered, there never having been any strain or injury of any kind. In the corpus cavernosum were four nodules, three on the left side and one on the right, varying in size from a pea to that of a French bean; they were perfectly circumscribed, hard to the touch, knot-like, and painless when handled. There were no enlarged glands in the groin, the patient had never had syphilis, and he was of good health and of his usual weight." The nodules slowly diminished in size, two disappearing during the course of two years without treatment.

There are two marked differences between this variety and the first: one, the shape and feel of the induration, which are here nodular, instead of more or less flattened, plate-like thickenings; the other is, if Sir P. Hewitt's view be correct—for no necropsy has verified it—that as these nodules originate in gouty thrombosis, they will be more amenable to treatment, if it is thought worth while to initiate this.

(3) **Diabetes.**—MM. Verneuil and Tuffier consider this to be a cause. Thus the latter, out of twenty-six, found fifteen patients to be gouty, and eleven diabetic.

While the preceding are much the most frequent varieties and causes, the following must also be mentioned:

(4) **Injury.**—This mode of origin is very rare. The injury may be a contusion, twist, or, as in a case of Ricord's, the induration may date to a tear taking place during "a very violent erection." In this instance the patient was young; the corpora

cavernosa were apparently ruptured at one spot, giving rise to extravasation of blood and subcutaneous ecchymosis. A nodule gradually formed, producing a notable deformity of the penis during erection. In one of Cruveilhier's cases mentioned above, the induration had followed on very considerable violence, compression, and twisting of the penis during erection.

(5) **Urethritis,** usually gonorrhœal. How far this can produce these indurations by itself is doubtful. If it had been a *vera causa*, one would have thought that these indurations would have been met with more often in the corpus spongiosum, and would have been more common after gonorrhœa occurring in patients no longer young. Ricord (*Gaz. des Hôp.* 1847, p. 270) relates the case of a man, aged thirty, who had had a urethral discharge for four years; for some months nodular masses had formed in the substance of the penis, at first more numerous on the left than on the right side. After a time, a greater number had appeared on the right side than on the left, so that the penis no longer curved to one side, but now curved upwards so as to touch the abdominal wall above the pubes. Johnson (*Genito-Urinary Organs*, p. 230) mentions a somewhat similar case in a barrister of over middle life, whose normal condition of life seems to have been that of gonorrhœa. Here the irregular induration of the corpora cavernosa, both sheath and erectile tissue, led to a sort of spiral twist of the penis. M. Mauriac (*Ann. de Dermat. et de Syphil.*, No. 7, 1887) considers gonorrhœa to be the principal cause of the disease, but he does not explain why it only occurs in some of the many patients who have been the subjects of the above disorder, nor why it affects the corpora cavernosa, not the spongy portion. Out of the fourteen cases which he reports, six apparently dated to one or more attacks of gonorrhœa.

(6) **Syphilitic induration** of the corpora cavernosa. Ricord believed that a syphilitic change occurred in these tissues analogous to that attacking the tunica albuginea of the testicle. He describes a form of induration which, in its onset, and result, is exactly similar to those already given as probably of a gouty character. Lancereaux does not mention this condition. B. Hill states that gummata in the corpora cavernosa do, though very rarely, occur. They begin as ill-defined, deep-seated, painless lumps, and, according to Zeissl, are nearly always situated in the posterior third of the organ. They produce curving of the penis, and may disappear spontaneously, or may break down if not treated (p. 689).

The *points distinctive* of a gumma in this position would be a well-marked history of syphilis and the evidence of late secondary or tertiary affections elsewhere, a lumpy rather than a plate-like feel, a tendency to approach the surface and to involve the skin, and the results of treatment. In my opinion, syphilis has nothing whatever to do with the indurations of the corpora cavernosa of the ordinary kind, occurring spontaneously.

Treatment.—It will have been gathered from the above account that patients, the subjects of gouty thickening or thrombosis of the penis will most often come for treatment because of some altered direction of the penis during erection. No active treatment is to be thought of in these cases. The patients may be assured that the induration will not spread,* that it will not break down, nor undergo any malignant degeneration. On the other hand, they should be made to understand that the induration will probably persist (unless due to gouty thrombosis), and that if intercourse is continued, more and more management will be required in its performance. Those indurations of the nodular kind, which are probably due to gouty thrombosis, will probably disappear with time, aided, if the patient so desire, by rubbing in a mercurial ointment and judicious general treatment. For the other gouty thickenings nothing will suffice; removal will only make bad worse, and blistering,† iodine, or strapping will only entail useless discomfort and waste of time. Most patients will be sufficiently sensible to accept such advice and to act upon it, a result aided by the fact that at this time the sexual fires are burning low. Others insist in going about from place to place for advice. A few are much depressed mentally. Where there is season to suspect syphilis, gonorrhœa, or stricture as a cause these must be treated. When tenderness or pain are present pointing to a sub-acute inflammation, treatment on the lines given at p. 668 will give relief.

SECTION II.

FORMATION OF CARTILAGE AND BONE IN THE PENIS.

These cases are extremely rare and their interest mainly pathological.‡ Their nature is still obscure. In most cases it is probable that the condition is an advanced degree—*i.e.*, a calcification—of the gouty thickening described at p. 678. In other words it is analogous to atheroma. But it is certain that in some cases true osseous tissue has been found in these "bones." This was so in the cases of Rey and Lenhossék.

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* In very rare cases, where the sclerosis is extensive and severe, it may go on to calcification or even ossification.

† If a blistering fluid be used, care must be taken not to let any run on to the scrotum.

‡ Velpeau records a case (*Nouv. Elém. de Méd. Opérat.*, t. iv. p. 316). Three

These "bones," which seem to pass through a preliminary stage of cartilage, are found chiefly not so much in the erectile tissue itself as in the tunica albuginea, and especially in the septum between the corpora cavernosa. There is usually one, but in Lenhossék's case there were four. The patients are of middle or later life. In no case does injury seem to have been a factor.

Velpeau mentions two cases of partial ossification of the penis; in one there was a long osseous prolongation from the pubes into the left side of the penis, fifteen lines in length, suggesting an origin in the suspensory ligament.

Treatment.—Where the "bone" is single, where it has ceased to grow, or where micturition is rendered difficult and painful, where the patient, owing to the interference with coitus, is bent on an operation and is quite prepared for the doubtfulness of the result, an operation may be safely undertaken with the advantages of the present day.

The following case of MacClellan's is given in the *Nouveau Journal des Sciences Médicales,* March 1878: In a man, aged fifty-two, the penis was curved upwards, and a kind of hard cord could be felt in it. The distortion was such that urine could not be passed without much difficulty and pain, and coitus was impossible. On division of this cord the curve was diminished, and micturition rendered easy. A little later the same trouble returned, and a bony mass was now discovered in the septum between the corpora cavernosa. When this was dissected out the bleeding was severe, but yielded to the use of cold water. The upward curvature of the penis was removed by the operation, which resulted in a slight inclination in the opposite direction.

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more recent recent cases are quoted by Kaufmann: Rey (*Bull. de la Soc. Anat.*, 1874, t. xvii. p. 213); Lenhossék (Virchow's *Archiv.* Bd. lx. S. 1); Duploy *Ann. des Malad. Gén.-urin*, Jan. 1885; *Centr. f. Chir.* 1885, S. 383). There is an excellent preparation (No. 2342) in the Museum at Vienna, which is figured by Demarquay, but no history is given. It appears to be an ossification of the septum, and was obtained from a patient aged fifty.

CHAPTER VII.

ACUTE GOUTY AFFECTION OF THE PENIS.

SIR J. PAGET (*Studies of Old Case-Books*, p. 15) relates the following case of "acute gout of the penis." "It may," he says, "be observed that with gouty inflammation of the urethra there is commonly more swelling, heat and aching of the whole penis than is found in any but the most acute infective gonorrhœa; and that this may be counted amongst the diagnostic signs of the gouty disease, especially when it has continued long or recurred often. But in the acute case which I saw the swelling was much more than usual and was the chief sign. The patient was a gentleman sixty-six years old, tall and thin, often gouty, rather weakly and anæmic, with very irritable, capricious digestive organs, which he had not spared from work. Forty years before his present illness he had been treated for urethral stricture after gonorrhœa; but he had long thought himself cured of this. In the last seven years he had often had gouty attacks, some of them typical and acute; and in the last of them had what he described as severe inflammation of the penis, with pain, redness, turgescence, and purulent discharge from the urethra. All this, excepting the discharge, subsided together with the other signs of gout, and during the last year he had had better general health than usual, though the urine-stream remained much smaller and more feeble than it was before.

"In the last week before I saw him, the penis, which had been of natural size, had again enlarged. The glans and the anterior three-fourths of the body were as large as during full erection, though not nearly so firm or tense as in that state. They were tender to the touch, not over hot and throbbing, pendulous, not rigid or curved. There was a thin purulent discharge from the urethra, and its orifice and the visible part of its canal looked as if lined with a thin layer of yellowish false membrane. The urine was turbid with excess of acid, the tongue was thickly coated, but there was no fever. Calomel, colchicum, and liquor potassæ were given, and after four days the swelling of the penis had much subsided, but he had severe lumbago. This lasted about two days, and five days later he had gouty pains in the left great toe. The penis had steadily decreased, and four days later, when the gout in the toe had become more marked, it had nearly returned to its usual size. The attack had lasted nearly three weeks. When the urethra had become fit for examination, a very narrow stricture with surrounding induration was found near its orifice. Probably some narrowing had long existed, and had been increased during the recent acute inflammation; for during that attack the stream of urine had not only been very painful, but had been evidently decreasing in size. The stricture was gradually dilated with instruments, and for four years the patient was free from serious local trouble. At the end of this time he had another attack of inflammation of the penis just like that which I have described, associated with well-marked signs of gout, with excessively acid, turbid urine, but without any marked difficulty in passing it. This attack, also, subsided like the others, and he died some years afterwards with the constantly increased defect of his power of digestion."

CHAPTER VIII.

NEURALGIA OF THE PENIS.

UNDER this heading I include the two following conditions. Some of my readers may remember Mr. Hilton's case of "Pain on one side of the Penis depending on Disease of the Perineal branch of the Small Sciatic Nerve" (*Rest and Pain*, 5th edit. p. 243). The gentleman, when asked to localise his pain, traced it, crossing the ascending ramus of the ischium, to one side of the penis. Upon careful examination of the neighbourhood of the tuberosity, and the ascending ramus of the ischium, Mr. Hilton found considerable thickening on the left side, and, after some manipulation, a cord-like mass rather bigger than whipcord. Upon inquiry it turned out that this patient was accustomed to sit upon a hard and somewhat uneven seat, and that this led to thickening of the soft parts, and to the pressure on the nerve, and so to the pain. A cure was effected by making an eschar with nitric acid so that the patient could not sit upon the thickened affected parts, and by the use of a hollow cushion.*

Of another condition, more rightly called neuralgia, I have seen two cases. The patients were fifty-eight and sixty-three respectively. In each case an obstinate pain was complained of in the glans penis. This and the adjacent parts were healthy. There was no evidence of pressure on the pudic nerves. The patients were healthy-looking for their years, but neither could be said to be of abstemious habits. In neither case was there reason to suspect an over-anxious nervous temperament. The pain was spoken of as dull and aching, and always referred to a point in the glans-tissue about midway between the meatus and the corona. There was nothing paroxysmal about the pain, nothing sudden in its onset or disappearance. It was lost during sleep, but was made worse by wine or spirits. Failing to find any other explanation, and remembering Sir J. Paget's dictum, that neuralgias are often gouty in origin, I treated these patients on these lines, and with entire success. But if the above explanation be correct, it is difficult to see why a structure like the glans, which consists mainly of tortuous veins, and which is not rich in fibrous tissue, should be thus attacked.

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* Mr. Hilton also relates a case in which similar pain was brought about in a lady much given to sitting on one side by a thickened bursa over the tuber ischii which pressed upon the same nerve.

CHAPTER IX.

GUMMATA OF THE PENIS.*

THESE are only of importance from the point of view of diagnosis, and because they, occasionally, are forerunners of epithelioma (p. 718).

Gummata of the penis are very rare. Lancereaux does not mention them. Ozanne could only collect eight cases out of all the French literature on venereal disease (*Rev. de la Chir.*, 1883). According to Kaufmann, scarcely as many German cases can be collected.

They may occur on the prepuce, the skin of the penis, the glans, or in the erectile tissue of the body of the penis.

Of the first situation the following is a good instance (B. Hill, *loc. supra cit.*, p. 289). The case appears to have been a tertiary gummatous infiltration of the prepuce followed by sloughing. The importance, especially in younger patients, of finding such other evidence as the cicatrices in the pharynx, &c., is noteworthy.

T. M., aged forty-one, had been infected with syphilis twenty-one years before, and showed well-marked cicatrices of the pharynx and deformity of the epiglottis and larynx. Two months previously, a little shallow sore had shown itself on the prepuce near its free border. In six weeks the sore turned black and became covered with a thick scab, a week later, swelling of the penis and groins appeared. On admission into the Lock Hospital the whole penis was œdematous, the œdema spreading outwards to the groins, where the glands were enlarged. A sore, with a hard base and covered by a black crust, occupied the outer surface of the prepuce on the right side. Iodide of potassium was given, and lead lotion applied. A week later the scab had fallen and the sore was granulating. This healed under prolonged treatment.

Jullien (*Malad. Vénérien.*, p. 806) describes the three following

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* I have not described those phagedænic sores which may destroy the whole of the pendulous part of the penis, and which are so rarely seen now. Their treatment would run on the lines given at p. 639.

varieties of gummata of the penis: (1) Gummata developed in the cellular tissue of the furrow behind the corona.—Jullien states that gummata in this position are liable if untreated, when they have sloughed and healed, to leave behind cavities of varying size, skinned over and adherent to the deeper parts.

(2) **Gummata of the Corpora Cavernosa.**—These are extremely rare. They occur as nodular bodies situated, according to Zeissl, nearly always in the posterior third of the organ, indolent and painless save during erection, when they are liable to cause chordee.

(3) **Gumma of the Urethra.**—This also is extremely rare. A few cases have been described by Fournier and other French writers. The anterior portion of the urethra seems to be usually attacked. The part of the urethra affected may feel like a pipe with hard walls; later on, this condition may be replaced by that of ulceration, a foul purulent discharge may escape from the meatus, and fistulæ may form on the under aspect of the urethra; the ulceration within may spread forward to the meatus, and out on to the glans, showing the characteristic, greyish-yellow slough.

Sequelæ of Gummata of the Penis.—We shall see (p. 718) that the scar of a gumma may degenerate into epithelioma, and that gummata may perhaps interfere with distension of the penis (p. 681); they may also lead to destruction of the glans. According to two cases seen by Luecke (*Deuts. Zeitsch. f. Chir.*, 1873, Bd. ii. S. 362), gummata of the penis at the juncture of the glans and the corpora cavernosa may degenerate into solid, painless swellings of scar-tissue, adherent to the skin, leading to an advanced degree of stricture, and, in one case, to formation of a urinary fistula.

In the diagnosis of gummatous ulceration here, if the local condition be anomalous, the chief points to notice are the existence of other tertiary lesions, and the result of potassium iodide.

Treatment.—Nowadays, severer steps should never be resorted to, until a trial has been made of potassium iodide. Luecke, in both the cases mentioned above, found himself obliged to resort to amputation, since the use of drugs was unsuccessful. This is only what we see elsewhere in subjects of old tertiary syphilis —*e.g.*, in long-standing ulcers of the leg. The origin is certainly syphilitic, but, in its later stages, drugs have no effect upon the local manifestation.

CHAPTER X.

TUBERCULOSIS OF THE PENIS.

I HAVE given at p. 637 full importance to the risk of infection of the wound of circumcision with the tubercular virus. The following is an instance of tuberculosis of the glans penis in the adult. It is recorded by P. Kraske (Ziegler's *Beitr. z. path. Anat. u. z. allg. Path.*, Bd. iv. Heft ii.; and *Journ. Cut. and Genito-Urin. Dis.*, 1891, vol. ix. p. 343).

The patient, aged forty-nine, presented himself at the Freiburg Clinic with two irregularly shaped ulcers, the bases having a yellow cheesy appearance, with, here and there, a tendency to the formation of granulations yielding a thin secretion. The edges of the ulcers were undermined, and communicated with each other. The patient was healthy, with no evidence of past or present tuberculosis. The epididymes, testicles, and prostate were healthy; the urine was normal, and showed no bacilli. The patient's first wife, who had given birth to several healthy children, had died of a cardiac affection; the present wife, who had given birth to a child ten months previously, was carefully examined for local or general tuberculosis with a negative result. The mischief on the glans began three months before the patient was admitted. Owing to his wife's pregnancy, his last intercourse with her had been several months before that.

The ulcers being found to extend well into the body of the glans, amputation was considered necessary. A microscopic examination confirmed the clinical diagnosis, as both typical giant cells and bacilli were found. The surface of the glans was less affected than the deeper tissues, showing apparently that the mischief had taken its origin from beneath, and not as a surface infection as was at first believed. The author was forced to the conclusion that the local trouble resulted from an infection through the blood rather than from a local inoculation.

If this view be correct, the after-history of this patient will be especially interesting. As the glans penis was the only part affected, as the habits of out-patients are often most uncleanly, and as we know, from other parts of the body, how varied are the methods of inoculation, I should have thought it much more probable that this was one more instance of local tuberculosis of unexplained origin.

M. Looten has published (*Des Scrofulides des muqueuses*, Thèse, Paris, 1878) a case observed by Fournier. A young man, aged twenty-four, had on his penis an ulceration which was at first taken for a chancre, but all question of syphilis was soon put on one side by M. Fournier. Healing followed in three months, without specific treatment. The diagnosis, "lupus of the glans," was soon confirmed. Some time later, the cicatrix broke down, and the lesion assumed its former appearance and increased in size. It had all the characters of ulcerated, tuberculous lupus.

CHAPTER XI.

DISEASES OF THE VESSELS.

SECTION I.

AFFECTIONS OF THE BLOOD-VESSELS.

Nævi or Angeiomata are referred to in the chapter on new growths.

Varicose veins are met with occasionally on the penis, but very rarely cause any real trouble, though in nervous patients I have had much difficulty in convincing them that enlarged veins here do not mean any diminution in virility. If it be really needed, aseptic excision will rid the patient of his trouble as safely as in the case of veins of the lower extremities. Demarquay (*loc. supra cit.*, p. 306) describes, with two figures, the case of a patient on whose glans were ten or eleven varices, which dated to a kick received on the part fourteen years before, when the penis happened to be semi-erect. During erection these varices disappeared entirely, being compressed between the rigid glans and the anterior extremity of the corpora cavernosa.

The same writer quotes (p. 299) a traumatic aneurism of the dorsal artery, under the care of Malgaigne (*Rev. Méd.-Chir.*, juillet 1850). From the account the case seems to have been one of wound of the prepuce by a knife carried in the pocket of the patient, followed by great ecchymosis, swelling, and secondary hæmorrhage, but not one of aneurism. The hæmorrhage was arrested by laying open the wound and underrunning the bleeding point.

With regard to a case quoted from Albinus (*Annot. Acad.*, lib. iii. chap. v.) as aneurism of the penis, this appears to have been really a subcutaneous rupture of one of the corpora cavernosa after a severe twist received while the penis was in a state of erection. A painful swelling followed, soft like an abscess, but becoming large and hard during erection. Nothing is said as to pulsation. This was diagnosed as an abscess and opened in spite of the opinion of Albinus. Severe hæmorrhage followed, proving fatal in a few days. At the necropsy one of the corpora cavernosa was found to be dilated, forming a pouch filled with blood. Boyer seems to have met with a similar case which, by his advice, was left alone.

If such a case occurred nowadays, it might be met by laying open the cavity, turning out the clots, and plugging with aseptic gauze, until the wound had granulated, the penis being strapped, if needful, to a metal catheter.

SECTION II.

PRIAPISM.*

This condition—one of continuous erection without desire—is a very rare one. The erection may be complete or incomplete; in the former case it is usually extremely painful. The condition is nearly always unaccompanied with sexual desire.

The **causes** are very various.

In some cases there has been an **injury** which has led to extravasation of blood into the cavernous tissue of one or both corpora cavernosa. In such cases, though a history is not always to be obtained at the time, there has often been excessive indulgence in, or an injury received during coitus, the patient in either case having been often drunk. It is important to remember this class of case, as they are all extremely tedious, and as it is probable that in some cases, whether an incision is made or not, permanent induration and scarring may remain at the site of extravasation, interfering with coitus subsequently.

In other cases the condition is probably due to **excessive stimulation of the sexual centre** , usually from the periphery below. Here, too, there has been repeated coitus, and the patients are let down in health.

It is probable that priapism may be an early symptom of **leukæmia,** but its causation here is quite uncertain. Dr. Salzer, of Worms, has published (*Berlin Klin. Woch.*, 1879, Bd. xi.) a case which he believes to have been of this kind, but as no examination of the blood was made, and as a necropsy could not be obtained, this case is far from reliable. The patient, aged forty-six, woke one morning with a strong erection, which became persistent, lasting for seven weeks. The only condition discoverable was a marked enlargement of the spleen, due to a previous attack of intermittent fever. At the time that the priapism subsided, the patient gradually got weaker, and sank about a year after the onset of the priapism. Before death the spleen reached to the umbilicus. Abstracts of eight other cases are given: leukæmia is stated to have been present in five.

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* I insert the account of this condition here, for the sake of convenience, under the heading of affections of the blood-vessels of the penis. More correctly, perhaps, it should come under the heading of injuries.

The following is taken from the *British Medical Journal*, 1883, vol. ii. p. 736: "Professor Ketli, of Buda-Pesth, has described a case of leukæmia, accompanied with priapism. A man, aged thirty-five, was seized last October* with a severe attack of paludal fever, followed by bronchitis; ever since then priapism had been present. At first the erections occurred daily, lasting for several hours, and totally unaccompanied by subjective phenomena of any kind; but for the last two weeks that the patient had been under observation, priapism had been continuous and very painful. The morbid condition was confined to the corpora cavernosa, the glans being perfectly unaffected. The urethra became so compressed by the swelling of the cavernous part of the organ, that the catheter had occasionally to be used. The spleen was enormously enlarged, and the proportion of the colourless corpuscles in the blood was greatly increased. No enlargement of the lymphatic glands could be detected. Lupulin and bromide of potassium had been given, but without effect, as might be supposed."

The following explanations of priapism in leukæmia have been given. Kremme believes that it is produced by effusion of blood into the corpora cavernosa, corresponding to the hæmorrhage from the nose which often occurs. Longuet considers that the circulation through the organ is interfered with by the formation of thrombi, which originate in the great increase in the number of white corpuscles. Pressure on the nervi erigentes by enlarged lumbar glands, and changes in these nerves, or in the nerve-centres, are other causes which have been suggested.

It is well known that priapism—though here there is turgescence without rigidity—follows on **injuries of the cervical**

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* This probably refers to October 1882. Neither the duration of the priapism nor the result of the case are given. The source of the paragraph is stated to be "a Hungarian medical journal."

and upper dorsal cord (p. 479). Its absence in head injuries is equally well known. It has been met with in cases of cerebellar hæmorrhage, but its occurrence here is probably due to irritation of fibres passing up through the crura and pons (p. 479). I have alluded at p. 480 to another form of irritation of the tracts passing up between the lumbar centre and the brain, and which may explain the erections (now temporary) occasionally so troublesome in early locomotor ataxy, general paralysis of the insane, &c.

Other instances of **priapism (also temporary)** are seen in the gouty, especially at night, disturbing the sleep, or towards morning. These occur without erotic feelings, and disappear without emission. An instance of priapism occurring during an attack of acute gout has been given at p. 684; another, as a sign of deep inflammation and thrombosis of the prostatic plexus, at p. 674. The occurrence of this condition in some cases of growth, as sarcoma of the penis, is mentioned at p. 739. Cantharides is another cause of temporary priapism, here accompanied by venereal excitement, and often associated with some degree of strangury.

In children a temporary priapism is very common, even in infants, being readily started and maintained by such irritation as that of phimosis, stone in the bladder, or ascarides. In a child under my care with extensive nævus of the skin of the penis and the glans, priapism was constant until the disease was cured by the use of the cautery.

Symptoms and Clinical Course of the Case.—The corpora cavernosa appear to be the parts which are usually chiefly affected. The glans penis is less turgid, while the corpus spongiosium usually escapes altogether. The cavernous bodies are turgid even to rigid stiffness; the more marked these features, the greater is the pain and tenderness. The latter is sometimes limited to one spot, where an injury or sprain of one of the corpora cavernosa has perhaps taken place. Pain is usually a marked feature, present day and night, the patient lying on his back, with his knees drawn up to prevent the contact of the bedclothes. Pain may also be felt in the perinæum, along the crura. No redness or other evidence of inflammation are .present. The position of the penis varies; thus, it may be in contact with the abdominal muscles, at a right angle with the body, &c. Micturition is not usually interfered with, though when, owing to extreme distension of the corpora cavernosa, the urethra is pressed upon, there may be difficulty in emptying the bladder.

The duration varies, but is liable to be most tedious and disappointing, especially in those cases where extravasation of blood has taken place. Thus three to six weeks is not an uncommon duration. In a case of Mr. Birkett's (*Lancet*, 1867, vol. i. p. 207) the man was five months in Guy's Hospital, and in one recorded by Mr. Tripe (*ibid.* 1845, vol. ii. p. 8) the conditions lasted four months. It must be remembered that in the former case incisions had been made which gave vent at first to dark, thick, bloody fluid, followed later by suppuration and the detachment of sloughs, an attack of pyæmia threatening at one time. In the second case the patient, younger than most of the other cases, and a sailor, no doubt kept up the condition by refusing to remain under surgical control, and in persisting in indulging in sexual intercourse.

Treatment.—This, up to the present time, has been unsatisfactory in the cases of continuous priapism, chiefly on account of the difficulty of promoting absorption of blood in structures so densely walled in by fibrous tissue as those of the corpora cavernosa.

Tartar emetic and mercury, pushed up to the point of nausea, purging and ptyalism, have been tried without effect. Iodide of potassium has been praised as successful; but it is to be noted that in one case,* that of Mr. Hird (*Lancet*, 1873, vol. i. p. 9[illegible]) the condition, which had already lasted a month, was showing some sign of relaxing and the pain of abating, before the drug was administered. In Dr. Booth's case, alluded to below, the trouble had lasted five weeks when the use of the drug, in five-grain doses, four times a day, was begun, and is said to have brought about a steady improvement by the end of a fortnight. Where the mischief dates to excessive stimulation of the sexual centre, bromide of potassium may be expected to be useful. Thus in a case reported by Dr. Hargis (*New Orleans Journ. of Med.*, Jan. 1869) fifteen grains of the salt given every two hours gave speedy relief. This drug was tried in half-drachm doses twice daily for four days in Dr. Booth's case (*Lancet*, 1889, vol. i. p. 978) without the slightest result. In this case, a sailor, aged fifty-five, the trouble began without assignable cause beyond exposure to wet and cold the day before.

With regard to local treatment, the continuous application of ice, begun about two weeks after the commencement of the trouble and kept up for two weeks (tartar emetic and potassium bromide having failed), was "followed by marked, but very slowly progressive diminution of the turgescence (Hulke)." The same remedy, however, failed in the case of Dr. Booth's. Its use was begun about a week after the commencement and is said to have been "continued for over a week." Oleate of mercury, belladonna, strapping, and leeches have also all proved fruitless. Morphia or chloral should be given for the sleeplessness, and where, as is often the case, the patient is low and depressed, a nutritious diet should be given after the bowels have been freely opened.

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* The condition here dated to an injury received in coitus during intoxication.

It seems to me, therefore, that the disease is one which is cured by time, and not influenced by remedies. Whether an aseptic incision will, in future, give better results remains to be seen. It should certainly be tried, and in an early stage. Without strict aseptic precautions such a course is certainly not to be recommended, on account of its more immediate and its later risks alike. Amongst the former are tedious suppuration, sloughing, and pyæmia. Later on, there is a risk that the power of erection may be lost, as occurred in Mr. Callaway's case (*Med. Repository*, April 1824) where the immediate result of a lancet puncture into the left crus had been rapid and marked relief. So, too, in the case of Mr. Hulke's, in which ice was used (*vide supra*), disability (perhaps permanent) for coitus followed. Here no incision had been made, and when the patient left the hospital the only objective trace of the priapism was a small, hard knot near the posterior part of the left crus.

In the following cases incisions were successfully used. The report is taken from the *Lancet*, 1888, vol. ii. p. 1244; as no reference is given, I have been unable to determine whether antiseptic precautions were attempted. Dr. Vorster of Berlin has "published two cases of priapism which were successfully treated by Prof. Rose by means of operation. The first patient was of hæmorrhagic diathesis, and was admitted for violent epistaxis. This was soon stopped, but severe symptoms of acute cerebral anæmia remained—headache, vomiting, and extreme feebleness of right arm and leg. Priapism came on in consequence of straining at stool, and further cerebral symptoms followed—insomnia, pains in the neck, paralysis of the sixth nerve, and loss of consciousness. The author consequently supposed that the priapism was due to hæmorrhage in the brain, produced by the violent straining. The measures employed consisted of localised applications, camphor, morphia, and chloral internally, long-continued tepid baths, and even the administration of chloroform, but all proved useless. After the priapism had continued for thirty-two days, Professor Rose determined, notwithstanding the hæmorrhagic diathesis, to make an incision in order to relieve the paraphimosis which also existed. This was followed by hæmorrhage, which continued for three hours. The priapism then began to diminish, and, in four days, the penis had returned to its ordinary conditions. Subsequently, marked splenic leukæmia developed. The author considers, notwithstanding the coincidence of leukæmia with priapism, which has been noted in medical literature, that here the leukæmia cannot have been in any way the cause of the priapism, because it was not developed until the latter had ceased.

"In the second case the priapism was due to hæmorrhage into the right corpus cavernosum, caused by an accident. This effusion exercised pressure on the veins, and thus caused stagnation of the venous blood in the corpora cavernosa. Professor Rose having diagnosed rupture of the urethra, performed external urethrotomy with the object of relieving the great distension of the bladder. During the operation a hæmatoma was found bulging forwards into the urethra. Upon an incision being made into this tumour, the priapism disappeared. The patient was cured in seven weeks."

In a case very fully reported by Dr. Mackie of Brechin (*Edin. Med. Journ.*, Nov. 1872, p. 418), a free incision was made, and though treated by poultices, was followed by rapid and uncomplicated recovery. The patient was aged seventy, of very intemperate habits, and not at all particular as to his morals. Erections coming on at intervals had threatened for some days, with numbness and crampy feeling in the right arm and leg. The priapism set in suddenly without any assigned cause. It continued with urgent distension, pain and tenderness, and resisted varying treatment for three weeks. By this time there was not only great rigidity, but also throbbing and inflammatory œdema of the prepuce, threatening to pass into paraphimosis. An incision, two inches long, was made through the enlarged and œdematous prepuce into the substance of the right corpus cavernosum. A large quantity of dark semi-clotted blood came away, the penis very soon became flaccid, and micturition, which had previously given some trouble, was performed without difficulty. The bleeding continued pretty severely for two hours, and then resolved itself into a very gradual oozing.

Had it not been for the thoroughness with which this case is reported, I should have thought it possible that the origin of the trouble was thrombosis of the prostatic plexus of veins, a view suggested by the age of the patient, the cramps in the right limbs, possibly gouty, the fact that the glans was at an early stage of the case very much enlarged and glistening, and by the occurrence of œdema of the prepuce, these latter points suggesting interference with the circulation in the dorsal vein.

SECTION III.

DILATATION OF THE LYMPHATIC VESSELS.

This has been noticed in a few instances. Bean (*Rev. Méd.-Chir.*, 1851) was the first to draw attention to it. When the prepuce is drawn back, one or more vessels, running transversely or in a network, are seen in the folds of mucous membrane behind the corona; these join a longitudinal group of vessels, varying in number from one to three. The chief distinctive point about these vessels is their dull-white contents. The causes which produce this condition are various. In Bean's case it followed a contusion received during coitus. In Trélat's case a blow was the cause. In Friedrich's case (Schmidt's *Jahr.*, Bd. lxxvi. S. 190) the dilatation of the lymphatics was set up by the obstruction to the lymph-current by an inflamed gland in each groin. These cases were met with in adults. Dr. Day (*Trans. Clin. Soc.*, vol. ii. p. 104) recorded the case of a child, aged seven, in which there was enlargement of the right leg and thigh, and later on of the prepuce, from some unexplained obstruction to the lymphatics. In this case chylous fluid escaped from a ruptured vesicle on the prepuce at the junction of the skin and mucous membrane, but there were no varicose lymphatics to be made out in this case, which seems rather analogous to those of scrotal elephantiasis (p. 576).

DIVISION III.

NEW GROWTHS OF THE PENIS.

CHAPTER I.

ELEPHANTIASIS.

THIS disease, which occupies a position somewhat by itself, being associated partly with inflammatory conditions, and partly with new growths, very rarely attacks the penis alone, even in regions where elephantiasis is common. Thus Kaufmann quotes the statistics of the Calcutta Hospital to show that out of 113 cases of elephantiasis, three attacked the prepuce and one the penis. According to Pruner, negroes, who have naturally a long prepuce, are especially liable to elephantiasis of this part. The best illustration of elephantiasis of the penis with which I am acquainted is one given by Mr. Hutchinson (*Clin. Surg.*, vol. ii. Pl. LXXII.) in a negro.

As is the case in the same disease when it attacks the scrotum, the causes fall into two chief groups: (α) One in which the filaria sanguinis plays an important part; (β) another group in which this parasite is absent, the patient perhaps never having been out of Europe. Here either some chronic irritation such as stricture is present, or some œdema, lymphangitis, or obstruction to the lymphatics higher up.

The disease begins in the prepuce, and in most cases extends over the whole penis. With regard to this extension, Kaufmann divides the cases accordingly as: (1) only the prepuce, (2) the prepuce and penis, and (3) the penis and scrotum are affected.

The dimensions of the organ are, in advanced cases, enormously increased. Thus cases have been described in which it reached to the knees, or even to the ankles. In the case of a Chinaman operated on by Sir A. Cooper, the organ measured 4 feet at its greatest circumference, and the mass removed weighed 56 lbs., containing in addition 2 lbs. of fluid. The skin is pigmented, cracked, uneven, warty below and anteriorly; where it is in contact with the scrotum and thighs it is smooth. The erectile tissues of the penis, save for some stretching, are but little altered, unless severe inflammatory conditions have preceded the elephantiasis; in such cases, as in old stricture, the erectile tissue may be tough and gristly.

The **symptoms** are very slight. The disease is very chronic, and save, for the recurrent attacks of erysipelas, painless. In the largest tumours, the chief difficulties are locomotion, alteration in the jet of urine, cracks, fissures, and rawness about the preputial orifice.

Treatment.—This will be either by circumcision or by removal of the diseased masses. The necessary details are sufficiently given at p. 581.

CHAPTER II.

INNOCENT NEW GROWTHS.

THESE are few, and save for papillomata, unimportant.

SECTION I.

SEBACEOUS CYSTS.

These are occasionally met with in the long prepuce of boys. Owing to the irritation which may accompany a phimosis, the duct of one of the sebaceous follicles is readily blocked. I have removed two by circumcision; each was on the under aspect of the penis, with the raphé running over it. One met with in a boy of eight was the size of an olive; the other, much smaller, about that of a small pea.

Cruveilhier (*Traité d'Anat. Path.*, t. iii. p. 334) describes a variety of sebaceous cysts of the prepuce, developed not from a cutaneous sebaceous follicle, but from the modified sebaceous glands which lie just behind the corona in the attachment of the prepuce which is midway between skin and mucous membrane. One such cyst was of the size of a fowl's egg. Fano (*Gaz. des Hôp.*, 1867) described two such cases; in one no less than six tumours existed, varying in size from a millet-seed to a French-bean. It is worth while remembering that, according to Caster, a blindly ending fistula in the furrow between the glans and the prepuce may be due to the spontaneous suppuration and opening of one of Tyson's glands which had become cystic and inflamed.

SECTION II.

ANGEIOMATA.

These, in the form of nævi, are occasionally met with on the penis, though they are not so common as about the genitals of female infants. They are usually cutaneous and diffuse or stellate in type. Very rarely they implicate the glans deeply. They should be destroyed early with the cautery, owing to the vascularity of the part and the irritation which their congestion brings about. In one boy, of three, in whom the skin of the penis and the glans was the seat of an extensive nævus, there was constant priapism.

SECTION III.

HORNS.

In this country these growths are mere curiosities. As an illustration of their rarity, out of 109 cases of cutaneous horns which Lebert collected, only six occurred on the penis. Their usual **origin** is in a wart, which may arise either from the prepuce or from the glans itself, especially from the corona. Another mode of origin is in a sebaceous cyst. They most commonly occur in adults after middle life, or in old age. A case which began in earliest childhood in a Russian peasant boy is referred to in the *British Medical Journal*, Aug. 13, 1887.

A good instance of their usual origin in a wart is given in Mr. P. Gould's case (*Lancet*, Feb. 26, 1887) which also shows how a horn here may be combined with epithelioma. The patient, aged fifty-two, had had congenital phimosis for which he had only been circumcised four years before. The wound healed, except in one place in the middle line, where a small granulation remained. Here a small wart developed and was followed by a second in its side. The first wart began to discharge and continued to do so ever since. On the middle of the upper surface of the glans was a sessile truncated horn, hard in consistence, of yellowish colour and translucent, the size of a small marble. The penis was amputated and some enlarged inguinal glands removed, the patient recovering.

Horns may occur in two forms—one flat, as a horny-plate, the other as a well-marked projection. Sometimes, both forms are present. Their curved shape, blunt extremities, longitudinal striation and tendency to split, painless condition and yellowish or black-brown colour, are very characteristic. Phimosis is often present.

Treatment.—This should be by efficient excision, the base of the horn being deeply cut out. Hæmorrhage should be prevented by the use of a Clover's clamp, or a miniature Esmarch's bandage. In some cases, circumcision will remove the growths. After a wart has been removed the patient should be carefully watched lest epithelioma supervene near the site of operation. Where the horn is in a pre-cancerous stage, or complicated with epithelioma, amputation of the glans or the penis may be required. The same step may be required where recurrence takes place after removal of the wart, an event which is not uncommon.

SECTION IV.

PAPILLOMATA.

As elsewhere, these may be soft or dry, innocent or malignant.

To speak of the first two varieties, soft warts are usually venereal, but a dry wart may, under irritation, become a matter of much importance. Thus a patient with a small and absolutely dry wart on the outer aspect, or at the orifice, of the prepuce may, after marriage, communicate to his wife an abundant crop of warts, surrounding the orifice of the vagina. A wart on the penis may, in rare instances, become developed into a horn, and later on, if the base of this ulcerates, epithelioma will follow. I have spoken at p. 553 of the soot-warts and of the signs which accompany their passage into a malignant stage; this most important matter will be referred to again (pp. 705, 710).

One other matter deserves attention with regard to warts of the penis, and that is that epithelioma and sarcoma may, here as elsewhere, present from the first a warty aspect, appearing simply papillomatous.

The soft warts are usually venereal, though occasionally soft and pinkish warts may spring up from the papillary structures of the inner aspect of the prepuce and the glans without any venereal origin. The site of the common venereal warts or vegetations is usually from the sulcus behind the corona, from which they extend forwards to a varying degree over the glans itself, and backwards, now becoming scattered over the skin on the dorsum of the penis. Their colour, in shades of varying red, according to their vascularity, their flabbiness and delicacy of structure explaining the proneness to bleed and the difficulty with which they can be seized for removal, and thus the readiness with which a single one left behind may prove the starting point of recurrence; their shape according to the length of their pedicle and the depth of the clefts, or, according as they are isolated or in larger masses, resembling heads of cauliflower, in other cases mulberry- or cockscomb-like;

their fœtid, acrid discharge. All these points are very familiar to those who have seen much of venereal practice.

The most important point in their **diagnosis** is whether warts have become malignant, a point which will have to be settled when the advisability of adopting amputation arises in a case where the warts are of long standing, when they have resisted previous, though perhaps inefficient, treatment, where they have grown rapidly under, and perhaps perforated, a long prepuce, where the patient is no longer young, and the inguinal glands are already enlarged. In these cases the constant bleeding, pain, and foul discharge may have produced anæmia, which may be mistaken for cancerous cachexia.

The chief points in the diagnosis will be given later on, in the account of epithelioma (p. 722), but I may state here that help will be derived from noting how far the warts are still superficial in their attachment or becoming deeper and infiltrating: from the evidence of ulceration between the clefts and the papillæ, this being often afforded by the presence of scabs, and from the failure of the treatment given below when perseveringly carried out. With regard to the glands in the groin, if these are enlarged and hard and tender,* there is a chance that the enlargement is only inflammatory. Microscopical examination of one or two warts removed by cocaine may also help in coming to a decision.

Treatment.—Where the warts are dry in structure and but scantily supplied with blood, they may generally be easily destroyed by some such application as glacial acetic acid, nitric or chromic acid, or the acid nitrate of mercury. Of these the first is by far the most painless.

Where the warts are vascular and present in crops, if there is no doubt that they are still in a non-malignant stage, attention, first, to cleanliness and dryness will be well repaid. Thus, the application daily of the liq. plumbi subac., or a powder of equal parts of savine, zinc oxide, and diacetate of copper, with a little boracic acid added, will bring them into a better condition for the operation. Every hospital surgeon knows how difficult it is to make certain of eradicating, at one operation, an abundant crop of soft warts, the hæmorrhage and oozing, and the fragility of structure explaining how some escape complete destruction.

As a preliminary, ether having been given, a Clover's clamp or an india-rubber catheter or a drainage tube should be applied, and the prepuce slit up if needful. The surgeon then, grasping firmly the body of the penis in his left hand, shaves off the growths, seriatim, with scissors curved on the flat. It is well to begin at the most dependent part, that any hæmorrhage, as it occurs, may flow away from the warts which remain to be dealt with. Plenty of lint torn up in small pieces and bits of wood with points of different sizes should be at hand; an assistant, as the warts are removed, stops any bleeding by firm pressure, then applies nitric acid or the acid nitrate of mercury, and after that firm pressure again. The hæmorrhage is sometimes very severe, but will always yield to pressure and a solution of persulphate or perchloride of iron. The actual cautery or Paquelin's thermo-cautery should be at hand, and if either is used (the ether being removed) it should be at a red-heat, and not allowed to cool, or it will stick: in such an event the thermo-cautery has an advantage, as it can be re-heated *in situ:* otherwise, and if detached and pulled away, it again sets up bleeding. The fine point of the thermo-cautery is useful when warts just within the meatus have to be dealt with. In this case a double-silk-web catheter may be needed for a day or two.

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* A softening and tender gland may be epitheliomatous and breaking down. My point is that epitheliomatous glands in their early stage are not tender.

CHAPTER III.

MALIGNANT DISEASE.

THIS, in the vast majority of cases, is carcinoma, or, more precisely, squamous-celled epithelioma. A few undoubted cases of sarcoma have been recorded, originating not in the epithelial structures of the glans and prepuce, but in the erectile tissue of the penis (p. 738). Glandular carcinoma may perhaps arise in the epithelium of Cowper's glands.

EPITHELIOMA.

This, the gravest disease of the penis, is not a very common cancer. Sir J. Paget and Mr. Sibley reckoned its frequency as amounting to 1 per cent. of all cancers. In Germany it has been met with more frequently; thus, according to Von Winiwarter, the frequency amounts to 2½ per cent. and by Billroth the figure is raised to 3 per cent.

Commencement.—We have to consider **two points** here: (1) **where,** and (2) **how the epithelioma begins.** The **starting-point** probably occurs with almost equal frequency on the glans and on the prepuce respectively. I say probably, because by the time that the patient comes under observation both glans and prepuce are usually invaded. Kaufmann on this point states that out of thirty-three cases the starting-point (a wart) was noted to be, in twenty, on the prepuce, and thirteen times on the glans.

The second point, **how the disease begins,** is far more important —(*a*) on account of the very great importance of recognising the disease in the very earliest stage of malignancy, or, still better, while yet "pre-cancerous" (p. 725); (*b*) because many of the initial forms of epithelioma of the penis are likely to be mistaken for other and non-malignant conditions.

Epithelioma of the penis,* when commencing, as it usually does, on the glans and prepuce, may appear first either superficially or in a more deeply seated form. The latter, it will be seen, is here, as in the tongue, of infinitely greater importance.

(*a*) By far the most frequent mode of commencement is a **wart** or a warty excrescence. Kaufmann states that out of thirty-three cases in which the commencement was noted, in twenty-nine it was a wart. The chief points to remember here are that whether the wart is dry or soft, single or multiple, sessile or pedunculated, it is, after a while, no longer limited to the surface, but encroaches on the subjacent parts; its root thus becomes fixed and indurated, and, finally, in the base ulceration takes place. At the same time it proliferates on the surface, assuming a cauliflower form. By the time, however, that the wart has become hard-based and ulcerated, there is reason to fear that the disease has passed beyond the first stage, and the one most favourable for radical cure.

(*b*) Another way of **commencement is more deeply seated**, and therefore nearer to the lymphatics from the very first. This is the form which patients describe as a "pimple," or a "pea." How this knot or lump of induration is started, whether in the irritation of a balanitis which sets up deeper changes, or from a change in a like condition of the glans analogous to leucomata of the tongue (*vide infra*), or whether it begins in a sebaceous gland of the prepuce, we do not know, but this fact remains and should be sufficient. "The lump or knot here is early cancer and nothing else. No drugs will affect it, and furthermore, the fact that the lump or knot is *beneath* the surface shows that it is nearer the lymphatics. These will be opened into when the lump ulcerates and breaks down, with the inevitable result." †

(*c*) Another form is a superficially excoriated or a **raw patch**. This is seen, not very unfrequently, persisting after balanitis, non-venereal and gouty (p. 655), in patients over middle life. A good instance of how it may lead on to epithelioma is shown in Fig. 85. Here too we have a condition analogous to one met with in the tongue, when a leucoma or leucoplakia becomes persistently raw, perhaps "blistered by a pipe." In either case, on the penis or the tongue, the superficial excoriation deepens, and becomes indurated; it is prone to frequent bleeding, and, in the penis especially, scabs readily, and under this scab ulceration advances insidiously but fatally.

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* I speak of epithelioma of the penis here advisedly, because in a few rare cases this organ is involved by mischief starting in the scrotum, or in the urethra (p. 709).

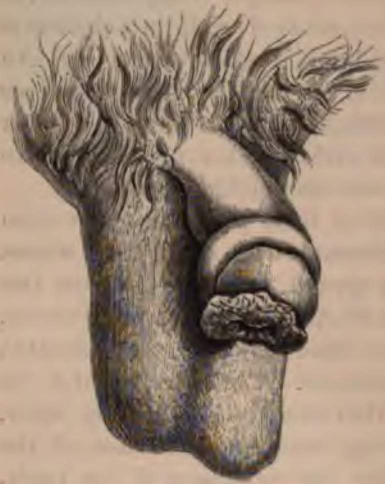
† I am quoting here from an article of mine on "The Pre-cancerous Stage of Cancer of the Tongue" (*Guy's Hosp. Rep.*, 1889, p. 258).

(*d*) More rarely epithelioma begins, from the first, as an **ulcer.** This may be started in the following ways: (*α*) On a chancre, soft, hard, or mixed, if neglected or irritated, and, if of any duration, in a man of middle life. (*β*) Another mode of origin in a chancre is in a healed scar which is fretted and broken down. (*γ*) An epithelioma may start as an ulcer, set up by some wound or laceration—*e.g.*, the tear of a naturally short frænum, or a crack in the edge of a tight preputial orifice, either of which have been subjected to irritation and never thoroughly healed.

(*e*) Infinitely rarer forms, and of little practical value from their rareness, are those **epitheliomata of the penis which begin in the urethra, or which spread to the penis from the scrotum.** A specimen, No. 2412^{40}, in Guy's Hospital Museum, illustrates the first. The patient, aged fifty-five, was admitted under Mr. Howse for supposed stricture. The case proved to be one of primary carcinoma of the urethra, a fungating ulcer, two and a half inches long being found on the floor of the urethra with masses growing into the substance of the penis. Some of the lumbar glands contained secondary deposits. Occasionally the penis is involved, through the corpus spongiosum, in another way, some fistula, which has formed in connection with a stricture in the ordinary way, becoming epitheliomatous. This is not at all common, but it is noteworthy, because when it occurs the change from inflammatory infiltration to that of epithelioma sometimes takes place very rapidly and over a wide area. The extension of epithelioma from the scrotum to the penis in cases of extensive chimney-sweep's cancer has been already spoken of.

In whatever way epithelioma of the penis commences, and however much individual cases may differ in detail, site and extent of the mischief, &c., when the disease is established it shows to a varying extent the two following chief appearances: (*a*) **excrescences** or **vegetations,** often coarsely papillomatous or cauliflower-like, recalling the papillomatous, exuberant, or outgrowing form of epithelioma. In such cases the penis may be enormously increased in size, its anterior extremity measuring six or nine inches in circumference. The papillomatous masses, florid red, or of a duller pink colour, may be separated into clusters by clefts, or fused together into masses, the surfaces of which from the welding together of the papillæ are smooth-topped, or show only superficial clefts. But in either case, however grouped the papillæ may be, their structure is changed from that of ordinary warts. They not only show centres of connective tissue with vessel loops ensheathed by epithelium, but they are themselves epitheliomatous, epithelial cells not only lying upon and between them, but entering into their intimate structure. And so it comes about that being themselves malignant and infiltrating, their bases are indurated and are clearly a part of the subjacent glans or prepuce, not merely an outgrowth from it; their base is thus infiltrated and the papillæ are thus deeply set. (*b*) Another condition which enters into an epithelioma of the penis, and which is better marked according to the duration of the case, is the presence of an epitheliomatous **ulcer**, and evidence of epitheliomatous **ulceration.**

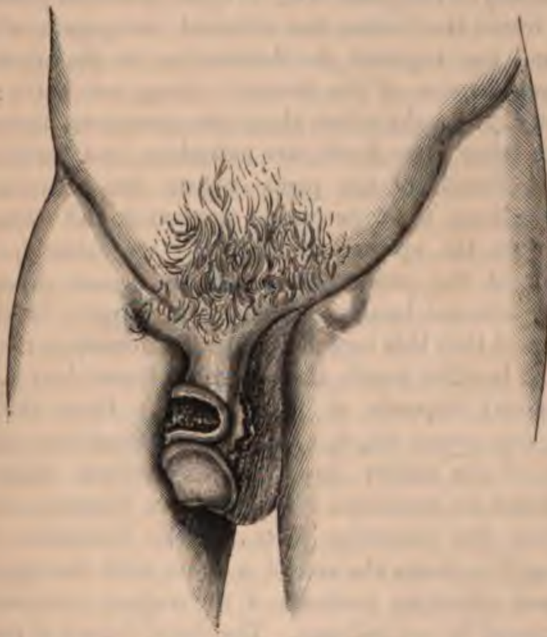
FIG. 83.



A good instance of the papillary form of epithelioma to be contrasted with the epitheliomatous ulcers in Fig. 84. I amputated the penis through its centre by the flap method (p. 726), and the patient made a good recovery. There were no enlarged glands in the groin, but I have lost sight of the case. (From a drawing by Mr. Sichel.)

The ulcer, which is most characteristic, may be associated clinically with earlier features in the case. Thus it may be due to sloughing and death down to their base of the papillomatous masses described above, or of the wart which long formed the original beginning of the disease. In other cases the ulcer dates to the persistence or deepening of some excoriation or rawness as in a balanitis, to the excavation of some tiny crack, or the breaking down of some scar. However it started, it tends, after a while, to show some of the following characters. The ulcer itself is excavated to a varying depth at different parts of its surface; its base and its edges are extremely hard owing to their consisting of growth infiltrating into the adjacent tissues. For the same reason the base is fixed. Its surface varies; at one part it is sloughy and perhaps greyish-yellow, at others granular and almost clean, or prominent with flabby, florid granulations, prone to bleed and scab, and in their turn breaking down. Other parts of the surface of the ulcer may be nodular or warty. Whatever appearance it shows the surface is prone to bleed; it is exquisitely tender, while from it exudes a thin and most disgusting fluid, prone to form scabs and crusts. The borders of the ulcer are raised and often everted; they may follow a smooth and uniform course, like a well-raised embankment, or be sinuous or zigzag, both of which conditions are shown in Fig. 84. In other cases, instead of being smoothly rounded to one level, they are heaped up at places, or nodular, or warty.

FIG. 84.



The above is a good instance of epitheliomatous ulcers. It should be contrasted with the papillary form of epithelioma shown in Fig. 83. The patient, aged forty-five, had had a venereal sore when fifteen, and the ulcer on the dorsum and right side of the corona appeared as a rawness in the site of this sore four years before the patient came to me. Another ulcer is present on the opposite side of the penis, and enlarged glands are seen in each groin. As induration extended into the body of the penis, I amputated this by splitting the scrotum. The result, a month later, is shown in Fig. 87. (From a drawing by Mr. Sichel.)

The microscopical anatomy is that of squamous epithelioma, and needs no details in a book like this. I shall refer to those points in it which are of importance in the diagnosis, later on.

As in its character, so with its progress, epithelioma of the penis behaves identically with the same disease elsewhere. It destroys locally, and it inevitably affects the nearest lymphatic glands. Both of these results are absolutely certain, even if at the time that it is seen the ulceration appears to resemble (a rare event) the more slowly growing rodent ulcer. In old days, before the time of anæsthetics, the operation was deferred until the malignant ulceration had destroyed the penis largely, even up to the pubes. Even nowadays, where the disease has attacked two points, which have ulcerated and run together, the destruction of the organ may be rapid. The extension of the disease is along two paths: one the lymphatics (p. 713), the other along the cavernous tissues of the penis. The latter is no doubt rare nowadays, and for this reason. The fibrous sheath of the penis resists the invasion of the growth for a long time, becoming thickened, and owing to this early condition the epithelioma eats its way slowly. Thus it comes about at the present time that the corpora cavernosa are usually only invaded locally, and involved directly in the malignant ulcer, and that this invasion is proportionate to the duration of the case. In other words, the cavernous tissue does not usually show secondary deposits at points remote from the disease. Kaufmann (*loc. supra cit.*, S. 275) could not find any evidence of penetration of the cancer into the erectile-tissue spaces in any specimen which he examined. That it does, however, take place, is clear from the following facts: In the Hunterian Museum, Specimen 4563A shows the end of a penis, with the upper part of the glans and adjoining portions of the corpora cavernosa extensively destroyed by epithelioma. The distal halves of the corpora cavernosa are much enlarged, and infiltrated with growth. On microscopical examination the glans was found to be infiltrated with epithelium forming whorls of cells, and in many parts narrow rods or columns. The corpora cavernosa showed alveoli filled with very small epithelial cells, many of them of an elongated form. In most cases, no doubt, when the disease has been of long standing, a section of the penis shows that the corpora cavernosa are infiltrated up to a certain point, and that here the disease terminates abruptly; beyond it the erectile tissue, which up to this spot, owing to the infiltration, has entirely lost its natural spongy aspect, is again natural, and the remaining portion is free from disease. Care, however, must be taken lest an opinion be prematurely given. According to Demarquay,* it is not very uncommon

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* *Loc. supra cit.*, p. 363; and *Gaz. des Hôp.*, 1860, p. 545.

(if the posterior part of the corpora cavernosa be examined attentively and the blood in the areolæ of the erectile tissue washed out) to find in parts which at first appear quite healthy, small, isolated, whitish grains, dispersed here and there in the erectile tissue, and which, when examined microscopically, are found to consist of epithelial cells, exactly similar to those in the original growth. Kaufmann would appear to look upon these collections of cells as lying in peri-vascular lymph-spaces. The practical bearing of this on amputation is obvious.

Though the glans is the part of the penis chiefly attacked, the urethra is rarely destroyed. Thus, even if the chief part of the glans is eaten away, the urethral opening can usually be found by a probe in the midst of such an ulcer as has been described. The lips of the meatus are of course gone, and the orifice is narrowed. At other times it is found at the bottom of a depression in a warty everted mass, as in Fig. 83. But in some cases irritability of the bladder and cystitis point to coming obstruction to the outflow of urine, either from the opening being narrowed as well as ulcerated, or to extension of the disease along the corpus spongiosum. Abscesses and fistulæ now form on the under aspect of the penis, and the patient's distress may be much relieved for a time.

A far graver **propagation of the epithelioma is to the inguinal glands** (Figs. 84, 85). The extreme gravity of this will be at once recognised when I say (1) that this is certain if the disease is left; but (2) that this complication, though not always detectable, is as a rule present by the time that patients come to us with epithelioma of the penis; (3) that glands apparently healthy may contain deposits of the disease; and (4) that it is this complication which brings about the fatal result, and renders of no permanent avail the complete removal of the primary disease (Fig. 85).

With regard to the first point Kaufmann states that of forty-eight cases the glands were only found normal in eight, and though it is not stated exactly whether this applies to patients when they first came under observation, his words imply that this is so. Gussenbauer, another well-known authority, has shown that by the time patients come for treatment, the inguinal glands are affected in a very large proportion of cases. In the three cases in which I have amputated the penis this year (1893) the glands were enlarged on both sides in each, and I should say that these were merely examples of a rule with extremely few exceptions. And if this matter be considered a little closely, the explanation is easy to find. To begin with, patients defer as long as possible the question of facing amputation of this organ. It is to be feared that in the pre-cancerous stage, here and elsewhere, medical men allow themselves to dally with drugs and local applications when it is clear that the time for their use has passed away, and thus take part in what is nothing more nor less than the cultivation of cancer. Finally, the rich supply of lymphatic vessels and the short, direct course which they run from the penis to the groin must be remembered. There is a median trunk which, at the corona, receives vessels from both sides of the glans; in addition to this, four or five lateral vessels run back on either side. Near the pubes the median trunk bifurcates, and its two divisions run with the lateral vessels into the innermost group of the horizontal groin glands. Besides these superficial lymphatics, some deeper ones run with the pudic vessels to open into the glands along the internal iliac artery.

The position of the innermost group of the horizontal groin-glands is of great importance as it lies near the junction of the saphena and femoral veins. Thus are explained (1) the fact that sooner or later the surgeon has to desist from further attempts to extirpate diseased glands; (2) the frequency with which the closing scene sets in with œdema of the groin and lower limb; and (3) the hæmorrhage which sometimes occurs from erosion of the vessels mentioned above.

The rapidity with which the invasion of the glands takes place is variable. In every case these two points, which are very influential, must be considered—the amount of exposure of the original lesion on the penis, and the rate at which ulceration takes place in it—two points which hang together. With regard to the influence of the first, just as an epitheliomatous ulcer of the tongue, constantly kept moist and warm, spreads more rapidly and invades the lymphatic glands more speedily than a similar ulcer on the prolabium which is more exposed and thus dries more readily, so an epithelioma of the penis starting on the inner surface of the prepuce or on the corona, where the secretion is more likely to be retained, and the moisture favour rapid ulceration, will invade the lymphatic glands more quickly than one situated on the cutaneous aspect of the prepuce or on an exposed glans. Thus, phimosis is potential not only in producing epithelioma (p. 717), but also on bringing about rapidity of invasion of the lymphatic glands. The rate at which ulceration of the epithelioma extends is another important factor. A reference to the different initial forms of epithelioma on the penis (p. 708) will show that some of them are more likely to start early ulceration than others. Thus, on the one hand, not only the dryness, but the degree of wartiness which the disease attains to the more it grows away from the penis, and, on the other, its persistent moisture, its having started as a deposit *in* the tissues, and its tendency to infiltrate these are all of great importance.

In whatever way the disease commences, as soon as infiltration has taken place, and the level of the lymphatics is thus reached, invasion of the groin-glands is certain. And it is not only certain, but it is peculiarly baneful here. It is certain from the richness of the lymphatics in this region; it is especially baneful owing to the way in which epithelioma affects the lymphatics, and the importance of the structures amongst which the groin lymphatic glands lie (p. 714). As in any other cancer, the gland tissue is gradually converted into carcinoma tissue, the meshes of the reticular tissue being changed into cancer stroma, while the interspaces are occupied by epithelial cells instead of lymph corpuscles. But the point which is important above all others—for it explains the poor amount of success as to really radical cure which attends the removal of enlarged glands after epithelioma of the penis—arises from *the fact that it is not cancer-cells alone which enter the groin-glands from the primary growth.*

Owing to the primary growth having often begun to ulcerate before operation, and the irritation to which an ulcer of the penis is liable, *inflammatory cells, as well as those of cancer, pass into the glands.* This infiltration of the glands with inflammatory as well as malignant deposits influences their future in two directions, most gravely. In the first place, as was the case with the original ulcer, these glands will be inflamed as well as infiltrated. If they are left, suppuration will set in. The glands are at first swollen, not very hard, and not adherent; on section, soft, succulent, and pinkish grey. Then they become harder, more adherent to one another and to the adjacent parts, and so more lumpy and massive. On section they now show a thickened capsule, some remains of gland tissue around an opaquely-white, evascular centre, which will, before long, break down and come away as a grumous, semi-liquid substance. Suppuration having once aided the discharge of their centres, the glands become more and more caverned out, and the groins may thus show ulcers as malignant as those on the penis.

If the glands are operated on, the following conditions interfere with a thorough extirpation of the disease:—(1) The number of glands, the abundant communications between the superficial and the deep groin-glands, the importance of the structures adjacent to the latter, and the fact that glands may be affected and yet be so minute as to escape the most careful operator. (2) The presence of inflammatory cells as well as of malignant deposit in the glands so fixes them to adjacent parts as to make it quite impossible to extirpate the glands completely. (3) Inflammation and softening setting in, leads to their breaking down during attempts at their removal, with, too often, the result that the shells of imperfectly destroyed glands, the seat of cancerous deposit, are left behind. These relics, owing to the vascularity of the surrounding parts, being increased by inflammatory changes, do not die, but preserve sufficient vitality to act, a little later, as foci of recurrent disease.

This failure in extirpating the glands completely, perhaps after a most successful amputation of the penis, is the more disappointing, as the disease does not usually spread beyond the deep glands of the groin.

Visceral metastases—*e.g.*, to the lungs, liver, &c.—is very rare, and when it occurs is perhaps to be explained by an early and unusually malignant invasion of the glands. Thus, in a case of Louis (*Bull. de la Soc. d'Anat.*, 1830, p. 99), deposits were found in the right auricle, the left ventricle, the lungs, and the liver. These metastases might be thought to have originated in an isolated nodule met with in the cavernous tissue of the penis, but a more likely explanation lies in the fact that, on the left side, one of the groin-glands had become adherent to the femoral vein, and, growing through the walls of this vessel, had found its way into the blood-stream.

Another explanation of visceral metastases is shown by the following case of Prof. Kocher, quoted by Kaufmann. The patient, aged fifty-three, had been the subject of life-long phimosis. On April 1881 the penis was amputated by means of the thermo-cautery for malignant disease of the prepuce and glans. In January 1883 he again came under treatment for severe stenosis of the urethra and extensive recurrence in the erectile tissue of the penis. The remains of the penis were now extirpated, the scrotum being split and the urethra divided behind the bulb, and brought out in the perinæum. Rapid healing followed, but in ten weeks there was a second relapse in the region of the right ramus of the pubes, where an irregularly nodulated, hard swelling showed itself, and also in two of the inguinal glands on that side. On April 12, 1883, Prof. Kocher again operated for the removal of the growth. The right testicle and cord having been taken away, the whole of the diseased bone and the enlarged glands were removed. The bladder and prostate were not injured. Again the progress of the wound was favourable, but early in May lung symptoms appeared, and the patient died May 14, 1883, the disease having then lasted for three years. At the necropsy, in addition to a fatty heart, bronchitis and emphysema, multiple deposits were found in the mediastinum, heart, pleura, and lungs; the remaining inguinal glands and those behind the peritonæum were not diseased.

In this case the unusual dissemination of the growth no doubt started in the disease about the ramus, which became involved from some extension to the right crus.

Causes.—(1) **Age.** Like epithelioma elsewhere, this is a disease of later life when the tissues are becoming less resistant to wear and tear. It is chiefly met with between fifty and seventy. It is rare before forty-five. I have, however, operated on patients aged thirty-three, thirty-eight, forty, and forty-four.

Kaufmann, from an analysis of 227 cases, states that most cases occur in the sixth decade, and after this in the fifth and seventh. Demarquay has collected cases of epithelioma between the ages of twenty-one and thirty years. Kaufmann in his statistics found that it occurred in three out of 130 cases between these ages.

(2) **Phimosis.**—Hey long ago pointed out that this condition predisposed to epithelioma, having found phimosis present in 9 cases out of 12. Demarquay in 59 cases of epithelioma found 42 affected with phimosis. Travers's statement, that cancer of the penis is very rare in Jews, agrees with this. The influence of phimosis is manifold; thus the products of the sebaceous glands become retained and decomposed, and the prepuce is rendered irritable, tender, and easily abraded; the free margin of its tight orifice is readily cracked; aggravated sources of irritation and of infection are present in sexual intercourse, and in the obstacle which is presented to the free flow of the urine at every act of micturition. Finally, the existence of phimosis exacerbates any commencing cancer. While due attention is given to the importance of phimosis, it must not be forgotten that cancer of the penis has been observed in cases where the prepuce has been duly removed in early life. Furthermore, a form of acquired phimosis which may appear later on in life will be alluded to a little later.

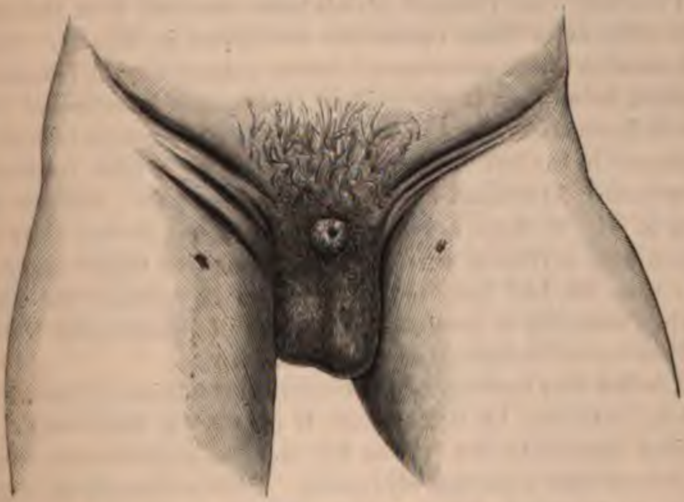
(3) **Venereal Disease.**—This may predispose to epithelioma in different ways—(*a*) In the production of warts, especially if kept

moist and septic under the prepuce, and constantly subjected to irritation; (β) by the formation of chancres, whether soft or mixed, especially if acquired towards middle life, if of any duration, if exposed to irritation, and either not subjected to treatment or worried into activity by caustics; (γ) by the scar of a chancre. This may be the cause of long-continued local irritation, leading later on to epithelioma. Of this the following is an instance:—A gentleman, aged sixty-nine, died of epithelioma of the penis, Sept. 3, 1865. When thirty-five years old he had a chancre, which healed up under mercury, but left a scar, which was visible for some time after. Seven years before his death, he noticed some redness in the locality of the scar. This redness subsequently became a raw surface, which extended from time to time, and then healed up. Five years before his death there was on the right side of the glans a patch of redness, the surface being raw, as if denuded of epithelium. The surface was slightly irregular, but not indurated. The following year the patch became distinctly warty. The patch was destroyed with glacial acetic acid, and healed up, but fresh warts formed at the side. Three years before the patient's death, the glands in the right groin became slightly indurated. It was not till a year before he died that any induration was observed beneath the sore. At first this was very limited, but by degrees nearly half the glans penis became hard and solid. This condition then extended along the body of the penis, and ulceration took place both here and in the glands of the groins (Sibley, *Trans. Path. Soc.*, vol. xvii. p. 177). (δ) In some patch of tertiary induration of the cellular tissue of the foreskin. A case of this kind in which a patch, probably gummatous, ulcerated, and then having resisted mercury, was removed while still in the pre-cancerous stage, will be found recorded by Mr. Hutchinson (*Trans. Path. Soc.*, vol. vi. p. 229).

(4) **Chronic Irritation.**—The influence of phimosis and its results has been already spoken of (p. 717). Other conditions, however, occur apart from phimosis, one of which especially is of the gravest importance. I refer to that form of balanitis which I have described as gouty (p. 655). In this disease, as life goes on, and the vitality and power of resistance of the tissues become more and more impaired, the moist surface persists, and becomes raw, the epithelial covering having disappeared. A little later still, the rawness, as it deepens, becomes an ulcer, and the ulcer gradually assumes the characters already given at p. 710.

The following is an excellent instance of this condition, to which sufficient attention has not been given, and of the fatal results to which an apparently trivial balanitis may lead, if untreated. J. D., aged fifty-two, was sent to me in June 1891 by Dr. Rowland Cox, of Lewisham. For some years he had been liable to much itching of the glans and prepuce, and had noticed an increasing difficulty in drawing back the foreskin. During the last month a patch of excoriation about the meatus had become ulcerated. The patient showed tophi in both ears, and his urine was loaded with uric-acid crystals. On admission the glans showed numerous patches of balanitis of no definite shape, and when taken between the fingers was as hard as wood; this feeling of hardness extended into the body of the penis. The meatus was, in part, destroyed by an ulcer with indurated base and hard, everted edges. There was a similar ulcer to the right of the frænum; the two being joined by a superficially eroded surface. A thin, but disgustingly fetid discharge came away from the ulcers constantly. An enlarged gland could be felt in the right groin. June 12. The penis was amputated through its centre, well behind the disease. A flap of skin and fasciæ was first cut from the sides and dorsum, a narrow-bladed knife being next passed into the interval between the corpora cavernosa and the corpus spongiosum, and carried downwards

FIG. 85.



A case of amputation of the penis by the flap-method, one year and a half after the operation. The disease, which began in an obstinate balanitis, non-venereal, and probably of the nature of a gouty eczema, is described above. Numerous scars of operations for the removal of enlarged glands (some of the groin glands were removed at the time of the amputation) are seen in either groin. The two dots mark the points where drainage-tubes were brought out.

and outwards so as to make a small flap (Fig. 86). The dorsal flap being then held out of the way, the corpora cavernosa were severed transversely. The arteries of these bodies being atheromatous stood out stiffly from the cut section. The urethra was next dissected out for quite an inch from the short inferior flap, and brought through an opening which had been made in the dorsal flap. The end of the urethra was next slit up into four small flaps, which were sutured with horsehair on to the face of the stump. The two flaps were finally adjusted with a few points of suture (Fig. 86). The mouth of the urethra admitted a No. 12 catheter easily. Four or five glands were removed from the right groin. The stump of the penis remained perfectly sound. On five occasions between October 1891 and January 1893 enlarged glands were removed from the groins. The incisions of these operations are shown in Fig. 85. On the last occasion the glands removed were so adherent to the femoral and saphena veins, that it was evident that further interference would not be justifiable. In April 1893 deep-seated, crampy pains began to appear in the left thigh and leg, and, a little later, œdema and deep-seated, ill-defined swelling about the groin. All the scars seen in Fig. 85 were, however, still sound, but it was clear that, before long, erythema, erysipelas, and ulceration would ensue. In this case life had been much prolonged in comfort, the patient having been able to continue his work as attendant in the National Gallery up to his last appearance in April 1893.

Another very interesting pre-cancerous condition of chronic irritation, described by Schuchardt, is quoted by Kaufmann. The patient, aged sixty-two, had on his prepuce greyish-white *plaques*, some confluent, some sharply limited. Microscopically the appearance was identical with that of psoriasis buccalis, from which fact Schuchardt gave to the condition the name of psoriasis preputialis.

(5) **Injuries.**—These may start an epithelioma (α) by a laceration. Thus the tear of the delicate skin of a tight frænum, constantly subjected to irritation and never satisfactorily healed, may ripen into an epitheliomatous ulcer. (β) A contusion. In the following case, one of Kronlein's, the epithelioma dated to a laceration followed by a contusion. A patient, aged twenty-six, strong and healthy, had his prepuce almost entirely torn off by a horse-bite. The glans received only a superficial wound, which had granulated completely, save at one spot the size of a pea, when the patient, in riding, was thrown against the pommel of his saddle, and the healed cicatrix broke down again. From this time onwards the wound healed no more, but developed into an ulcer

which resembled a phagedænic chancre, but was proved by microscopical examination to be malignant.

(6) A case which has been sometimes quoted as one of **infection** has been described by Mr. Bruce (*Trans. Path. Soc.*, vol. xix. p. 288). The patient was aged fifty-eight, and his wife, after suffering for many years from "cancer of the uterus," died in 1863. In the course of the following year the patient noticed a small, warty growth upon the glans, which subsequently became the site of epitheliomatous ulceration. This case is almost an isolated one, and the apparent connection between the two diseases is, I think, only a coincidence.

Quite a different way in which epithelioma may invade the penis is by starting in the irritation of an urinary fistula (p. 709). A still rarer mode of invasion, from the urethra itself, has been mentioned at p. 709.

Symptoms.—Many of these are given at p. 708, in the account of the commencement and early stage of the disease. Most frequently the disease is advanced by the time the patient comes under treatment, and many of the features which make up the epitheliomatous ulcer (p. 710) will be present and unmistakable to a careful observer. The symptoms will of course vary with the site of the growth, according as the epithelioma is on the prepuce or glans, and whether phimosis is present, or the urethra is invaded. Pain is slight at first, perhaps only provoked during coitus or erections. Later on, when marked ulceration is present, severe and lancinating pain may be present, radiating to the groins or the perinæum. The growth, especially when of the warty form, is not very sensitive; handling of the epitheliomatous ulcer usually brings on burning or stabbing pain. Foul smelling discharge, sometimes abominably fetid, is one of the most serious troubles. Hæmorrhage is rare; slight bleeding may take place when portions of the growth slough, but severe hæmorrhage is very rarely met with, even when the structure of the penis itself is involved, as the blood spaces of the cavernous tissue are obliterated close to the new growth. The size of the organ, especially when phimosis is present, may be much increased. If the circulation is interfered with a state of congestion is produced, causing a condition of priapism, favouring the vascularity and development of the growth.

Micturition is, as a rule, but little interfered with. It is often very striking how the urine makes its way from the midst of a mass of warty epithelioma which has surrounded and hidden the meatus: so, too, when phimosis is present. And even when the glans is extensively destroyed by an epitheliomatous ulcer, the patient will point to some opening on the surface through which the urine makes its way. Very rarely micturition is increasingly obstructed. Thus, in a patient of Boyer's, the bladder was distended to the level of the umbilicus, and relief was given by amputation of the penis. When the urethra is obliterated by the disease—and I think this is more probable in cases where phimosis is present—fistulous openings form just behind the obstruction. In some cases the obstruction to micturition is temporary, and relieved by sloughing of the growth.

Diagnosis.—As I have stated, patients, especially those of hospital rank, who furnish most of the cases, do not usually come under care until the disease is advanced, and its nature obvious. In the early stages the diagnosis is not always easy. The surgeon may be called upon to give an opinion as to the malignancy or innocence of the following conditions:

(α) Ordinary *vegetations* and *warts* are sometimes very difficult to distinguish from warty or papillary epithelioma. The presence of deep clefts between the masses of papillæ, and of constant, foul, ichorous discharge from these clefts which readily scab, and may conceal ulceration beneath, is very suspicious of malignancy. But the point which is decisive is the base of the papillomatous mass. If this be fixed and indurated, infiltration is probably present. The effect of treatment—viz., the result of a few days dryness and cleanliness (p. 705), and the result of microscopical examination when a small piece has been snipped off by the aid of cocaine—will also help in forming a diagnosis.

(β) Where an *excoriation* or *ulcer* is present the question may arise whether this is a chancre, a breaking down, tertiary syphilitic patch, or an epithelioma. Failure of treatment is here very important, as, when under an anæsthetic, a suspicious sore has been destroyed with nitric acid, and, in a week or ten days, is as painful and presents the same appearance as it did before, epithelioma is to be suspected even when induration and other evidence are but little marked. Where an excoriation, at first diffused and shallow, extends in width and depth, where an ulcer shows in addition to deepening excavation, induration of its base or borders; where the base is unequal in depth, uneven and warty; where an ulcer bleeds readily, and in the intervals of hæmorrhage yields a thin, ichorous, offensive fluid prone to scab; where the edges are raised, uneven, everted, and undermined—where many of these conditions are present, malignancy must be suspected.

But I would impress on my younger readers that many of these symptoms may be absent, and yet the sore may be malignant. Thus, the edges and base of an ulcer may both be devoid of induration, the former may be sharply cut, and the latter may be suppurating. Yet if a trial of nitric acid fail here, the ulcer will be found to spread, fungating growths will spring up, and about the time that typical induration is present in the sore, the inguinal glands will also be found to be involved. The following case (Hutchinson, *Path. Soc. Trans.*, vol. xiii. p. 167) is a good instance of the difficulty which may be met with. It is also most important on account of the age of the patient, the possible commencement of the epithelioma in the mucous membrane of the urethra, and the very rapid progress of the disease.

A healthy-looking man, aged twenty-two, applied to Mr. Hutchinson, under the impression that he had some venereal disease. His penis was greatly swollen, the prepuce being phimosed by œdema, and there being a dusky brawn-like induration in the under part of the organ, just behind the glans. This induration had already ulcerated in its centre, and the patient said that his urine escaped through the opening. Thinking that there must be a phagedænic chancre concealed, Mr. Hutchinson slit up the prepuce. No sore, however, existed beneath it. The induration below the urethra was now freely incised, and as this was done a considerable thickness of white, curdy material was cut through. Although puzzled with the case, at this time no suspicion crossed Mr. Hutchinson's mind that the disease was cancer. The man was only twenty-two, and looked in perfect health. He had noticed the swelling only about three weeks before, and had not had the slightest difficulty in micturition for more than a month previously.

The man continued to attend as an out-patient for about a month, and at each visit the granulations appeared more and more suspicious. He then disappeared for a while, but in three weeks again came under Mr. Hutchinson's care. There was now no doubt as to the nature of the disease. All the urine passed through the ulcer under the penis. This ulcer was about the size of a halfpenny, and covered over by warty, fungating granulations, like exaggerated cauliflower buds. Some glands in both groins were enlarged and hard. Microscopical examination of a small part of the edge of the ulcer showed the usual elements of epithelioma. Although the penis was removed far back, the urethra at the point of section was found distended by soft, warty granulations, and it was necessary to dissect out the corpus spongiosum for about another inch, in order to get to a healthy part. The urethra having been thus divided far back in the scrotum, it seemed best to provide for the freedom of micturition by making an opening in the perinæum. This was accordingly done. The man made a good recovery, and the perinæal opening answered its purpose well. Some of the urine, however, still passed in front. About five months after the operation a small mass of fungating granulations showed itself in the scar, close to the urethral orifice. In the course of a week these had increased to the size of a large nut, and closely resembled the original ones. They were destroyed by repeated applications of chloride of zinc. Eight months after the operation the man was in good health. The inguinal glands had diminished in size, but could still be felt.

When the urethra of the amputated part was laid open it was found to be occupied in all parts by soft, warty growths. The microscopical structures of epithelioma were everywhere abundant and definite. The tendency to growth rather than ulceration was a peculiar feature in this case, and was probably connected with the early age of the patient. The patient's skin seemed to be remarkably prone to the production of ordinary warts, of which he had a great number on the hands, scrotum, and thighs.

Before leaving the subject of diagnosis, I would say a few words on *epithelioma complicated with phimosis.* In these cases, as in the ones related at pp. 719, 732, the disease is still very frequently overlooked, until time has elapsed for the glands to become involved. At first induration is present; when ulceration sets in, a foul-smelling discharge is noticed, and loss of the glans substance can sometimes be made out through the prepuce. There is only one rule in such cases, and that is, that whatever be the age of the patient (and in cases of phimosis, epithelioma may occur at an unusually early age), the prepuce should be slit up without delay, and the disease dealt with according to its nature.

Treatment.—Any suspicious excoriation, ulcer, or wart should be early destroyed with nitric acid, with the aid of an anæsthetic (p. 706). Where, after this step, satisfactory healing does not take place, the diseased part should be early and thoroughly removed. There should be no dangerous waiting, no time lost in the exhibition of drugs which, even if the disease does date back to some long-past venereal trouble, are now perfectly useless.

We shall see, later on, that amputation of the penis, if performed before the glands are involved, is a remarkably successful operation; it has been already shown (p. 713) that if the glands become involved by secondary deposits, the disease is almost inevitably fatal. Though patients, by delay, will often baffle our endeavours to remove the disease while still limited to the penis, the above facts should be put clearly before them.

In epithelioma, here, as elsewhere, an early stage of the disease exists, in which operation will bring about a permanent cure. To this stage Mr. Hutchinson has given the name "pre-cancerous" (*Brit. Med. Journ.*, 1872, vol. i. p. 5). His words are so important as to well deserve quoting. "I have often explained and enforced the doctrine of a pre-cancerous stage of cancer, in the hope that by its aid a better comprehension of the importance of adequate and early treatment might be obtained. According to this doctrine, in most cases of cancer of the penis, lip, tongue, skin, &c., there is a stage—often a long one—during which a condition of chronic inflammation only is present, and upon this the cancerous process becomes engrafted. I feel quite sure that the fact is so. Phimosis and the consequent balanitis lead to cancer of the penis; the soot-wart becomes cancer of the scrotum; the pipe-sore passes into cancer of the lip; and the syphilitic leucoma of the tongue, which has existed in a quiet state for years, at length, in more advanced life, takes on cancerous growth. The frequency with which old syphilitic sores become cancerous is very remarkable; in the tongue, in particular, cancer is almost always preceded by syphilis, and hence one of the commonest causes of error and procrastination in treatment. The surgeon diagnoses syphilis, the patient admits the charge, the iodide of potassium seems to do good, and months are allowed to slip by in a state of fool's paradise. The diagnosis which was right at first, becomes in the end a fatal blunder, for the disease which was its subject has changed its nature. I repeat that it is not possible to exaggerate the clinical and social importance of this doctrine. A general acceptance of the belief that cancer usually has a pre-cancerous stage, and that this stage is the one in which operations ought to be performed, would save many hundreds of lives every year. It would lead to the excision of epithelial or epidermic structures which have passed into a suspicious condition. Instead of looking on while the fire smouldered, and waiting till it blazed up, we should stamp it out at the first suspicion. What is a man the worse if you have cut off a warty sore on his lip, and when you come to put sections under the microscope you find no nested cells? If you have removed a painful, hard-based ulcer of the tongue, and with it perhaps an eighth of the organ, and when all is done, and the sore is healed, a zealous pathological friend demonstrates to you that the sore is not cancerous, need your conscience be troubled? You have operated in the pre-cancerous stage, and you have probably effected a permanent cure of what would soon have become an incurable disease."

In a very few cases circumcision may suffice for the removal of a carcinoma commencing as a wart and in its earliest stage. According to v. Pitha and Podrazki, the glans has in some cases been found healthy, though included within a prepuce the site of epithelioma. Such cases are quite exceptional. Circumcision will, very rarely, suffice for the removal of a suspicious wart or a persistent ulcer, but the disease is very rarely met with in this stage, and after this very limited operation recurrence must always be dreaded.

As a rule one of the following **operations** is required for epithelioma of the penis.

i. **Amputation of the Penis.**—By this is meant removal of the penis usually at some point in its pendulous portion, the corpora cavernosa being divided in front of the crura, and the corpus spongiosum in front of the bulb.

ii. **Extirpation of the Penis.**—Here all the erectile tissues of the penis are removed, the corpora cavernosa being removed *in toto* by detachment of their crura, and the urethra being severed behind the bulb.

iii. **Removal of Diseased Inguinal Glands.**

(i.) **Amputation of the Penis.**—As I much prefer the knife to the galvanic cautery, for reasons given below, I shall describe the former method alone fully here.

A. **Flap amputation** (Fig. 86).—While the circular method gives good results, the use of the flap is, I think, to be preferred, as it secures a natural skin covering for the severed corpora cavernosa, and the urethra being brought through the flap, a continuous skin covering is secured. It thus prevents, a little more surely than does the circular, any delay and irritation which healing by granulation entails. I have given below reasons which make this end especially desirable of attainment here. The flap amputation was long ago suggested by Professor Miller,* of Edinburgh, but this surgeon cut his flap from below. If, as I have recommended, the flap is taken from above, it will be found to fall into position more readily over the raw surfaces of the corpora cavernosa. I have made use of this method in nine cases with excellent results. The parts being shaved and cleansed, a Clover's clamp is applied to the root of the organ, or if this instrument is not forthcoming, the vessels are commanded by an india-rubber catheter or piece of drainage tube secured tightly in place by a pair of Spencer Wells's forceps.* The skin now being slightly retracted or drawn forwards, according to its laxity and the site where the penis is to be severed, so as to avoid a redundancy or a deficiency, the surgeon cuts a flap from the sides and dorsum of the penis resembling, in miniature, the upper skin-flap in amputation of the thigh. This incision should go down to the tunica albuginea, and the flap when raised should contain the dorsal vessels and nerves. The knife (a narrow-bladed one) is then entered between the corpus spongiosum and the corpora cavernosa on the level with the base of the flap, and is made to cut its way out downwards and forwards for about three quarters of an inch (Fig. 86). From this small flap the urethra is next dissected out, with blunt-pointed scissors, care being taken not to buttonhole it. The dorsal flap being then held back, the corpora cavernosa are severed at a level with the base of the flaps. The dorsal arteries and those of the corpora cavernosa, and any others which can be seen, are next secured with chromic gut or fine silk. The clamp or drainage tube is next removed, and Spencer Wells's forceps applied to any spirting points. The venous hæmorrhage, which is free at first, will stop if the penis is raised, and all

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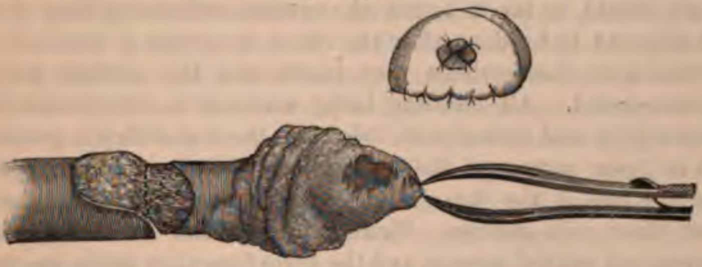
* In Mr. Butlin's *Operative Surgery of Malignant Disease*, p. 262, the credit of this operation is wrongly given.

Fig. 86.



Flap amputation of the penis. The dorsal flap is shown folded back. The dotted line shows where the corpora cavernosa would be severed. By means of a pair of tenaculum-forceps, some tension is being put upon the penis. The appearance of the stump, with the urethra slit up and stitched *in situ*, is shown in the upper figure.

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* If the drainage tube is secured by a knot in the usual way, there will be much more trouble in unfastening it when the vessels have to be secured.

compression removed. When the penis is amputated far back, all that is needed is a sufficient supply of the above forceps; they serve also to keep the stump forward, while the bleeding, however free, is arrested by their forci-pressure or by ligature. Care should be taken to cut the urethra sufficiently long at first. If this has to be done after the clamp or tubing is removed very troublesome hæmorrhage may result, and the urethra may be button-holed. All bleeding being arrested and the wound dried thoroughly and dusted with iodoform, the dorsal flap is punctured at its lower part, and the urethra brought through this opening on the face of the flap. The flaps are next united with a few carbolised silk sutures. Finally, the urethra is slit up on its dorsal and ventral aspects, and the little flaps thus made are united by points of fine silk or horsehair to the margins of the opening on the flap (Fig. 86). To admit of this being readily done the urethra must be cut sufficiently long, and the opening on the face of the dorsal flap must be sufficiently large, not a mere puncture. The above method of treating the urethra, whether the flap or circular method of amputation is made use of, is most important, and second only to dividing the penis sufficiently behind the disease. Otherwise, catheters must be employed frequently at the risk of causing exquisite suffering to the patient, constantly disturbing and breaking down the wound, and finally leaving the patient with a very tight traumatic stricture which will embitter his life, and shorten it by cystitis and renal degeneration, which might all have been avoided by the adoption of these simple details.

The hæmorrhage which accompanies this operation must not be allowed to be a bugbear in the mind of the operator. Even when the growth has destroyed the penis and involved the scrotum, as was the case in the patients from whom Figs. 84, 87, 88 were taken, and no form of tourniquet can be employed, nothing more is needed than an ample supply of the above invaluable forceps, by which every vessel, as it spirts, is at once secured, the forceps drawn out of the way by an assistant, and the vessels then tied off in batches. If any difficulty is met with in dealing with the bleeding from the corpora cavernosa when amputated far back, the stump can readily be brought forward and kept under control by passing a suture of carbolised silk through it, and fixing this in the skin flaps when these are adjusted later on.

Circular Method.—I have given above my reasons for preferring the flap method which, in my opinion, involves more certainly a good result at the cost of a little more trouble. If the circular method is employed the following points must be attended to. The same precautions must be taken as to cleanliness and preservation of a proper amount of skin. The end of the penis being drawn forward and the skin being made duly tight in front and behind, the corpora cavernosa are severed from above downwards; as soon as the spongy portion is reached care is taken to cut this longer than the corpora cavernosa, so that it projects well from the rest of the section. The other steps of the operation are carried out in the manner already described, and the same care being taken here to dissect out the urethra sufficiently long, and to stitch it to the margins of the skin. Whichever method of amputation is employed care should be taken to keep the wound aseptic throughout, by irrigation with lot. hydr. perch. 1–2000. After amputation of the penis by the flap or the circular method, the simplest **dressing** will be found the best. The wound, when sutured, is so small that all that is required is to paint it with a little collodion and iodoform, cover it with a little aseptic wool (this being renewed from time to time), to keep the bedclothes off the part with a cradle, and to secure that the patient's surroundings are sanitary. In cases where the surgeon decides to employ a dressing, he may make use of a sealed one, after the fashion of that employed by Mr. Ballance (p. 634) in circumcision in adults. If there is any risk of cellulitis or erysipelas, Sir J. Lister's boracic-acid dressing may be thus employed. Moist boracic-acid lint * is carefully adjusted so as to cover the wound but to leave the urethral opening exposed; outside this deeper dressing a loose piece of the moist boracic lint is wrapped and covered with gutta-percha tissue, or green protective, and kept *in situ* with a T-bandage. This outer dressing is of course removed by the patient for micturition, and a fresh one then readjusted. The deeper dressing is only changed once or twice in twenty-four hours. A little of the lotion may be sprinkled on it when the superficial one is removed. Any sutures which are tight should be cut—they need not be removed—the next day.

Removal by the Cautery.—For this purpose the heated loop or the thermo-cautery blade has been employed. I have the strongest objection to this method, for the following reasons: (*a*) The hæmorrhage, for preventing which this method is resorted to, is not to be needlessly dreaded at the present day with the instruments at our command (p. 728). (β) It is entirely incorrect to say that the cautery is a preventive of hæmorrhage. This is not true either at the time of the operation, or later on. There is very great difficulty in maintaining the metal at the required bright-red heat, and in severing the erectile tissues sufficiently slowly so as to produce sealing up the cavernous tissues. This, from its vascularity, sticks to the "knife" or wire, and either a white heat is employed which severs the organ far too rapidly, or the instrument is detached from the tissues which stick to it and hæmorrhage is invited. It cannot be too strongly pointed out the searing left behind by this method, while it is very uncertain in arresting bleeding makes it very difficult to secure any points which may be oozing freely. Again, a few hours after the operation, or later still, during the detachment of the sloughs, the patient is still liable to hæmorrhage. (γ) It is not easy to secure a sufficiently long and patent urethra (a step the importance of which is not to be over-estimated) even when a catheter has been inserted and severed *in situ* by the cautery. (δ) The wound is sloughy and tedious in healing. In the case of the penis it is not easy to secure complete asepsis, but the above method leaves behind it a tediously healing and septic wound, which contrasts very sharply with that secured by the flap method. If any are inclined to look upon these as trivial matters in so small a wound, I would remind them that this operation is one of which the importance and sequelæ are out of all proportion to the size of the parts severed. The patients are usually advanced in years, degenerate in tissues, of poor vitality and healing power, and often peculiarly depressed in mind owing to the loss to which they have to submit. In such patients as these a septic condition and a tedious healing of the wound exposing as they do the sufferer to needless risks of erysipelas, cellulitis, and broncho-pneumonia, are very far from being slight matters. And the above risks will be increased a hundred-fold by the danger of hæmorrhage which is inseparable from this method.

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* Lint soaked in a saturated solution of boracic acid at nearly the boiling point, and then allowed to dry. By Sir J. Lister's advice it should always be soaked before it is used, not only to add fresh acid, but because the lint when applied moist is less liable to slip, and also for the sake of purifying the lint itself, which, in the dry state, has no power of acting upon septic dust adhering to it.

(ε) This method entails special instruments, which, as is notorious to those who are familiar with them, are not always in working order. On the other hand, the method I have recommended merely requires instruments which are in ordinary use.

Question of Castration after Amputation of the Penis.—In many cases this is a most advisable step. We owe the suggestion of it to Mr. Wheelhouse (*Brit. Med. Journ.*, 1886, vol i. p. 187). In speaking of two cases of amputation of the penis, in one of which the testicles were removed, while in the other they were left, he says: "The result in the two cases was as marked as it was different. The two patients lay in contiguous beds, were constantly comparing notes, and never failed to give me the benefit of their discussion. The removal, though it added greatly to the severity and danger of the operation, did not prevent the patient from making an excellent recovery, and he has many times since spoken to me with the greatest gratitude and thankfulness for the complete relief I had afforded him in every way. In the case, on the other hand, in which I did not remove them, they became from first to last a cause of trouble and distress. Soon after the operation they became swollen and remained tender for a long time; they were there as a possible seat for the return of the disease, and by their physiological action they were a constant source of annoyance."

With regard to this question every case must be judged by itself. When the patient is advanced in life, or where his vitality is greatly depressed, castration should not be performed. I have, since reading Mr. Wheelhouse's paper, in every case of amputation of the penis—where from the age of the patients there is reason to believe that castration will prove beneficial—been in the habit of advising them to submit to this step.* Both sides of the question should be put before them in a straightforward and sympathetic way. The meaning of what is proposed should be made perfectly plain, and that before a witness who can be relied upon to keep the matter to himself. In one matter I cannot agree with Mr. Wheelhouse, for I have not found that castration has "added greatly to the severity and danger of the operation." From my experience, the majority will decline the advice. The three patients (the case of one of them is given at p. 733) who availed themselves of it, were most thankful for the result.

Figs. 87 and 88 are instances of severer operations. Fig. 87 shows the result of a case where I had to amputate the penis far back, after splitting the scrotum, and Fig. 88 a still more extensive operation, the disease having destroyed the penis and involved the scrotum by recurrences after inadequate operations before the patient came under my care. In this case it will be seen that a double castration was also performed, a right-sided inguinal hernia dealt with, and glands removed from each groin.

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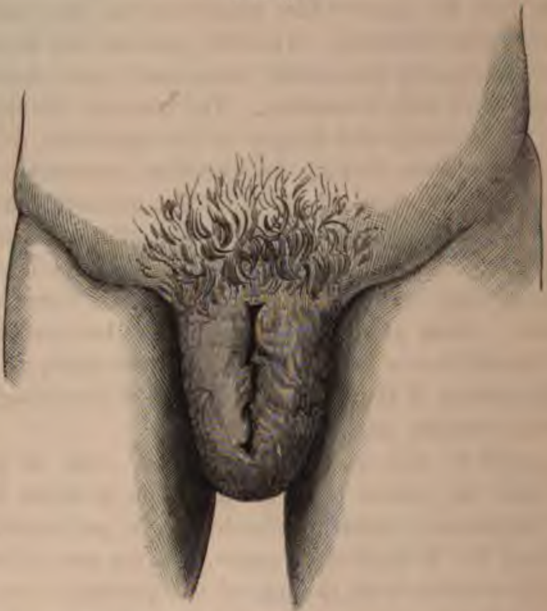
* At p. 717 it is shown that epithelioma of the penis is not unknown in early manhood.

FIG. 87.



The above represents the condition of the patient whose epitheliomatous penis is shown in Fig. 84, a month after the operation. The dark line in the centre shows the incision in the scrotal raphé by which the amputation was performed, not yet soundly healed. The urethra should always be at the lowest part of this. Castration was declined by this patient. The enlarged glands in the groin were subsequently removed by Dr. Fraser, at Romford. (From a drawing by Mr. Sichel.)

The patient was sent to me at Guy's Hospital by Dr. Carter, of St. John's Wood. G. B., aged thirty-two, had been always the subject of phimosis. About twelve months before he first noticed a small lump about the size of a pea beneath the prepuce, apparently on the glans. This increased in size and began to discharge. Three months later the penis was amputated; the disease recurred in the stump, and the organ was now again amputated[*] near the pubes. The inguinal glands were at this time hard and swollen. Two months after the second operation a hard mass was noticed at the junction of the stump of the penis and the scrotum. There was at this spot a large, foul, fungating, epitheliomatous ulcer. Both groins were full of enlarged, hard glands. There was also a scrotal hernia on the right side.

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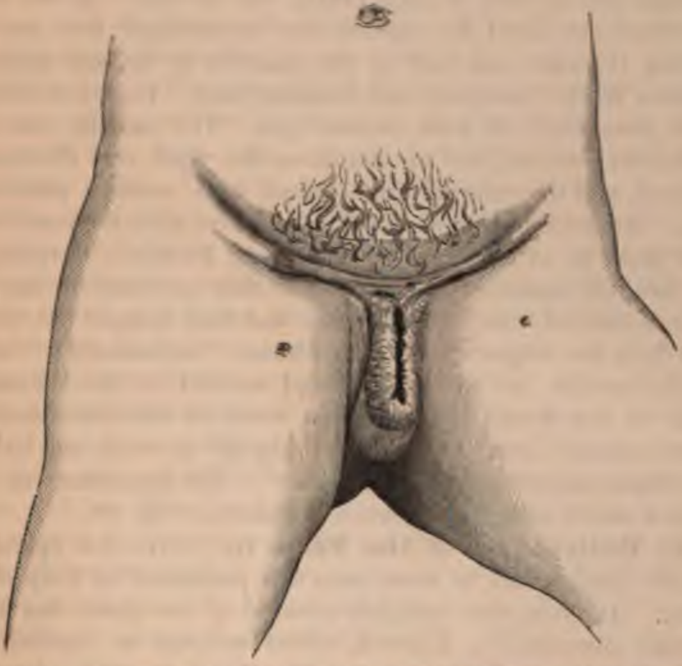
[*] The patient had been treated in a so-called "Private Home." He stated that he had paid £120 for his operations there.

FIG. 88.



The above represents the appearance of the parts in the patient, G.B., whose case is given at p. 732, a month after the operation. In the centre is seen the scar of that part of the wound which was last to heal. The opening of the urethra is not seen, being between the remains of the scrotum and the perinæum. The scars seen in the groins show where the incisions for the removal of the glands had healed last; the dots below mrak the points of counter-puncture for the drainage-tubes. Castration was performed here.

I advised the patient to submit to removal of the testicles, as this was likely, at his age, to add to his future comfort, while it would enable me to deal more thoroughly with the hernia and the enlarged glands. Jan. 13.—The parts having been thoroughly cleansed, two free incisions were made from either groin along the cruro-scrotal folds (very wide of the epithelioma), and meeting in the raphé of the perinæum. Flaps were then dissected back on either side. These were joined above by an incision passing above the penis on to the pubes, to allow of division of the suspensory ligament. As no sound or probe could be passed through the ulcerated stump of the penis into the urethra, the corpus spongiosum was separated from the corpora cavernosa, and cut through one inch in front of the triangular ligament. A pair of Spencer Wells's forceps being applied to the cut stump of the corpus spongiosum, the corpora cavernosa were next cut through just in front of their crura,* one by one. As no form of tourniquet could be applied, the hæmorrhage was met by cutting through each half of the penis bit by bit, and applying Spencer Wells's forceps to each bleeding point. These instruments were then tied off with chromic gut. The testicles and cord were then removed, and the hernia on the right side thoroughly reduced, and the external ring sutured with medium carbolised silk. Numerous enlarged, hard glands were then removed from each groin by an extension upwards along Poupart's ligament, of the two first incisions. Drainage was then provided for and the wounds sutured,† the urethra, which had been snipped out for an inch from the corpus spongiosum without "buttonholing" being finally brought out and slit up and sutured in the lowermost angle of the wound. The patient made an excellent recovery. Three months later he described himself as well, and having "excellent control over" his "water." The appearance of the parts a month after the operation is shown in Fig. 88.

(ii) **Extirpation of the Penis** (p. 726).—An operation of this kind seems to have been first performed by Delpech in 1832. In later years complete removal of the penis has been strongly advocated by Thiersch, whose writings on epithelioma are well known. In this country Mr. Pearce Gould has brought forward (*Lancet*, 1882, vol. i. p. 821) an excellent operation for removal of the entire penis, which will be described here.

The parts being shaved and cleansed the patient is placed in lithotomy position and the scrotum split from the root of the penis to the perinæum, along the raphé. Vessels are secured by Spencer Wells's forceps, and by a little dissection the corpus spongiosum is exposed. This step is facilitated by the previous passage of a sound, but if, as in the case I have related at p. 733, a stricture exists, the surgeon need not trouble himself. The corpus spongiosum being carefully separated from the corpora cavernosa is followed backwards until a part well behind the disease is reached, the triangular ligament being exposed if needful. The sound is then withdrawn and the urethra is cut across and still further isolated until a sufficiently long stump is set free to admit of its being brought out later on, and fastened, *in situ*, in the posterior angle of the wound. An incision is then made round the root of the penis, or if this is destroyed by the disease, wide of this spot commencing on the pubes and passing downwards on either side, by two oval cuts, to join the central incision below. The suspensory ligament is next cut through by knife or scissors, and the corpora cavernosa detached in the same way until the crura alone remain attached to the pubic arch on either side. Bleeding, however free, is up to this time arrested by Spencer Wells's forceps. These are now all tied off with fine silk so as to clear the field of the operation. The crura are next attacked. It is usually advised to detach these with a periosteum elevator or a blunt dissector. The attachments to the bone are, however, as I have found in two cases, so extremely close that the point of the knife or blunt pointed scissors must be used. Whatever instrument is employed, it must be kept very close to the bone, and used with great caution, especially when detaching the crura from the inner aspect of the rami. If the bone be found involved it must be resected, but the outlook is now extremely grave (p. 716). The hæmorrhage now met with may be very difficult to arrest. The following means will suffice: (*a*) Under-running the bleeding points with fine silk by means of curved needles. (*b*) If this fail in one or two cases, Spencer Wells's forceps may be left *in situ* for two or three days. Though this will prevent complete closure of the wound, I prefer it to the following method, which induces septic complications. (*c*) The use of Paquelin's or the actual cautery at a dull red heat. The urethra is now brought out in the lower angle of the wound, and split up and the flaps united to the lower angle of the wound, which will be either in the scrotum or the perinæum, according to the extent of the disease, the directions given at p. 728 being followed. Before the scrotal wound is united with sutures of carbolised silk or horsehair, every bleeding point should be secured, iodoform dusted in, and a drainage tube inserted. One of the dressings advised at p. 729 should be employed. Around the urethra, which must be left exposed, iodoform should be painted on. If the urethra is properly slit up and fixed, the patient will have no difficulty, especially if he turn on one side, in passing water into a porringer.

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* The cut section being perfectly healthy, I did not, as I intended, proceed to detach the crura.

† One of these sutures was passed through the cut corpora cavernosa so as to keep the stump well up, and to prevent bleeding.

This will be found less irritating to the wound than making use of a catheter and tubing. If a catheter is used it should be an india rubber one.

I have performed extirpation of the penis three times. Two of the patients made good recoveries, and the third, the subject of diabetes and albuminuria, died ten days after the operation, with gangrene of one foot. His case is as follows: E. G., aged sixty-two, a gamekeeper, came under my care at Guy's in August 1891. He had always been the subject of phimosis. For seventeen months there had been a discharge from under the prepuce and, latterly, difficulty in micturition, which the patient had tried to relieve by the use of a piece of zinc tubing, by which he thought "he had poisoned the wound." The whole penis was greatly swollen and thickened as far as the pubes; on the under surface the induration could be felt, through the scrotum, extending up to the crura. Through the prepuce the glans could be felt to be eroded and to have largely disappeared, and a most disgusting discharge dropped away from under the foreskin. The patient could only pass his water drop by drop, and with much pain. The glands were enlarged in each groin. On account of his miserable condition it was decided to give him the chance of relief by extirpation of the penis, although it was felt that this was a forelorn hope, as his urine, which was alkaline, contained albumen and sugar. A restricted diet and codeia were given for a few days, and on Aug. 15 I operated according to the steps already given. The urethra was cut through just in front of the triangular ligament, the fibres of the accelerator urinæ being first detached on either side. In separating the crura from the pubic rami, the adhesions were so dense that I broke a periosteal elevator. Scissors were used to complete the separation; the hæmorrhage was but slight, only one vessel on the left side giving trouble. Chloroform was given at first, and followed by ether. The patient never became himself after the anæsthetic, and lay listless and usually semi-comatose, at other times restless. It was difficult to get him to take food, and he died ten days after the operation. The urine was passed easily without any effort, but the wound became sloughy at the last, and gangrene of the left foot appeared before death.

For some years, after every amputation of the penis I have been in the habit of telling the patient, when he leaves my care, to insert at intervals into the meatus the end of a No. 6 or 8 olivary bougie, and to bring this with him whenever he returns to report progress, that I may see that no contraction of the aperture has taken place. Furthermore, whenever the penis has been amputated far back I advise the patient to carry about a small metal funnel with a long spout. By this means, the urine is carried away from the body, and does not fall over the scrotum, perinæum, and thighs. It is especially useful when the patient has to empty his bladder away from the privacy of his house—*e.g.*, in a urinal.

(iii) **Removal of Inguinal Glands** (Figs. 84, 85, 87, 88).—No detailed account need be given of any operation here. In many cases a most extensive and elaborate dissection will be required leading to exposure of the femoral vessels, the saphena vein, and the anterior crural nerve. The following points call for remark: (1) **Do enlarged glands ever subside spontaneously?** As in epithelioma of the penis not only cancer cells but inflammatory material may be taken up by the lymphatics (p. 715), it is just possible that, in a few cases, the enlargement of the groin glands may be inflammatory only. Thus, it is not surprising that spontaneous disappearance of enlarged inguinal glands has occurred in a very few cases, as appears to have been the case in the patients of Arnold Smith, Demarquay, and Billroth. On the other hand, a fact observed by Gussenbauer must not be lost sight of, as it has a most important bearing on this matter. This authority has shown that the inguinal glands often show microscopic deposits of cancer, before any naked-eye changes can be made out.

Thus any cases in which spontaneous disappearance of enlarged glands has been noticed must be carefully watched for a long time, lest, after any inflammatory swelling has disappeared, some minute deposit of cancer, present all the time, begin to grow apace. As a rule, any spontaneous disappearance of enlarged glands points to quiescence of the inflammatory cells which they may contain, and to this only. Any malignant deposit remains. That this happens in the very great majority of cases is made certain from the arrangement of the lymphatics (p. 714). I would therefore lay it down as a rule that any enlarged glands should be removed at once, at the time of the amputation if possible, lest, by waiting, precious time be lost.

In a very few cases, where the condition of the glands is doubtful or the patient's vitality is especially low, the operation may be deferred, and a short time spent in treatment by absolute rest, and the application of Scott's ointment or the oleate of mercury (10 p. c.), under firm pressure applied spica-fashion by means of Martin's bandages.

(2) I have already alluded to **the important relation of those** glands in the groin which receive their lymph from the penis to the femoral and saphena veins.

(3) In an extensive dissection in the region, where complicated layers of fascia are interfered with, and where the blood-supply to the skin is poor, great care must be taken to conduct the operation and the after-treatment antiseptically. **Sloughing and superficial gangrene** are not uncommon in this region, especially in patients of depressed vitality.

GROWTHS OF THE ERECTILE TISSUE OF THE PENIS.

This heading might almost run Sarcomata of the Penis, were it not that a few cases of secondary invasion of the erectile tissue by carcinoma have been recorded.

Thus, for the sake of accuracy, the following classification (Kaufmann) should be adopted:—

i. **Primary Sarcoma of the Erectile Tissue.** ii. **Secondary or Metastatic Sarcoma of the Erectile Tissue.** iii. **Secondary or Metastatic Carcinoma of the Erectile Tissue.**—The first of these alone is of importance to the surgeon.

i. **Primary Sarcoma of the Erectile Tissue of the Penis.**—Amongst the earliest cases are the following, described as "fibro-cellular" growths. Mr. Hutchinson (*Path. Soc. Trans.*, vol. vi. p. 228) records the case of a boy, aged eight. Enlargement of the end of the penis had been noticed only about ten weeks, though it latterly was increasing fast, and had on several occasions caused retention of urine. The extremity of the penis was four times the size of the rest of the organ, and the prepuce was in a state of irreducible phimosis. On handling the part, a large, hard, circumscribed mass was felt surrounding the base of the glans. On slitting up the prepuce a well-defined fibrous tumour was found attached by a broad base to the corpus cavernosum, just behind the corona. To avoid injuring the penis, this base was cut through, no attempt being made to enucleate it. In this case there was a doubtful history of an injury. Mr. M. Beck, in the same *Transactions*, vol. xxiv. p. 153, has published the case of a fibrous tumour of the penis in a man aged fifty-six. The growth formed first like a wart beneath the prepuce, close to the base of the glans. It was removed, and two years after began to grow again in the scar; for nine years it increased slowly. On admission, immediately behind the glans was a growth, about the size of a hen's egg, irregular and nodular in shape. It was excessively hard, and free from pain or tenderness. As it was impossible to remove the growth without seriously injuring the penis, and as the disease had recurred once already, it was thought better to amputate the organ. On examination, the growth sprang from the left corpus cavernosum, and it was evident that any operation short of amputation would have been followed by a second recurrence. Microscopical examination showed delicate fibrous tissue, with numerous oval nuclei.

Dr. Weir, of Newport, has recorded (*Amer. Journ. Med. Sci.*) a case of apparently rapidly growing sarcoma, occurring at an unusually early age. C. C., aged eighteen, had four months previously slipped on a ladder, bruising his penis between a rung and the pubes. The patient was in good health at the time, and there was no hereditary history of cancer. The injury was followed by some ecchymosis, and much swelling and soreness; no bleeding was noticed from the urethra. The swelling increased steadily, the penis being tense and continually erect. Since the third week pain had been persistent, and worse at night. Micturition had, latterly, been interfered with. On admission, the penis was much enlarged, measuring five and a half inches in length, and the same around the glans. The skin was normal. The growth did not extend beyond the root of the penis, being apparently confined to the corpora cavernosa, which were tense and elastic from thinning of their sheath. The cutaneous veins were much enlarged, and the whole organ visibly pulsated. The glands in the right groin were enlarged, one of them, the size of a pigeon's egg, being tender and bluish. Those on the left side were also enlarged, to a less degree. Considerable relief was given to micturition by slitting up the prepuce and performing external urethrotomy, but the penis and glans went on swelling, and a soft, fungous, easily bleeding mass, which sprouted from the corona, grew rapidly. The patient was taken home by his friends, and died seven months later, the end being hastened by hæmorrhage which followed an incision into the enlarged glands in the right groin. No necropsy or microscopic examination appear to have been made. The whole duration of the disease seems to have been eleven months.

Mr. Battle has published an interesting case of primary sarcoma of the penis (*Trans. Path. Soc.*, vol. xxxvi. p. 291). The patient was sixty. Ten months previously to his coming under Mr. Battle's care, he had noticed a blood-stained discharge from the prepuce after passing water, but took little notice of it, having no pain. The end of the penis gradually enlarged, and several slight attacks of hæmorrhage followed. It was only two weeks before the patient came to Mr. Battle that, after a more serious loss of blood, the part was first examined by a medical man. The end of the penis was much enlarged, the prepuce in a state of phimosis, and stretched over the growth, part of which projected from the orifice, dark-coloured and spongy in appearance. The enlargement extended for about one inch into the body of the organ, and was smooth and elastic. There was no ulceration visible. There was no enlargement of the inguinal glands. The penis was amputated, and the patient recovered sufficiently to leave town, but died forty-three days after the operation with jaundice, hiccough, and probably gangrene of the scrotum. The growth proved to be a mixed-celled sarcoma.

Mr. Battle mentioned a case of sarcoma described by Gross in his *System of Surgery*; it was a large growth which had spread from the penis to the pubes, and required an extensive operation for its removal, from which the patient did not recover. Dr. Sharkey, at the same meeting of the Pathological Society, mentioned a case of mixed-celled sarcoma of the penis which had been mistaken by the surgeon for epithelioma.

Mr. E. H. Fenwick has recorded (*Trans. Path. Soc.*, vol. xli. p. 193) the following case of sarcoma of the left crus penis. The patient, aged thirty-six, was admitted into the London Hospital under Mr. Tay, April 30, 1888. Four years before he had noticed intermittent pain of a shooting character in the perinæum, and, about five months after, he found a small swelling at the spot where the pain was experienced. This little tumour grew slowly at first, but recently it begun to increase rapidly. An oval swelling, of the size of a turkey's egg, projected from the left side of the perinæum, tender on manipulation, covered by natural skin, elastic in its anterior part, but firm posteriorly where it obviously had deep and strong attachments to the ascending rami of the pubes. It was in the position of the left crus. There was no stricture. When the swelling was removed it appeared that only a small tongue of it extended into the left corpus cavernosum, and that its greater part sprang from the fibrous sheath of the crus. The implicated cavernous tissue was cut freely away, and the troublesome hæmorrhage which followed was checked by the use of Paquelin's cautery. The growth was a mixed-celled sarcoma. The patient returned with extensive recurrence, January 1890. It was again removed, together with an extension into the left ischio-rectal fossa. Six months later there was no recurrence.

In a case of Podrazki's, the sarcoma appeared as an induration in the middle of the penis, as if the urethra contained a piece of bougie; there was a second induration farther back, the inguinal glands were enlarged, and the case ended fatally within a year of its commencement.

The two following cases are recorded by Kaufmann. The first was observed by Köhler. The patient, aged twenty-one, had received a blow on the scrotum nine years before. Four months before the operation, he detected an induration in the posterior part of the scrotum of the size of a hazel-nut, which caused dragging pain, and slight difficulty and smarting in micturition. On admission the scrotum consisted, as it were, of three parts. On either side lay normal testicles; in the middle was a hard, uneven swelling, as large as a child's head. The skin over this was natural, the inguinal glands on both sides were enlarged. The swelling was excised, and the enlarged glands removed. At the time of the operation the urethra was injured, and it was clearly made out that the growth sprang from the erectile tissue of the penis. Two months later the disease recurred *in situ*, and in both groins. Then multiple secondary deposits appeared, especially in the thorax, and the patient died of exhaustion. At the necropsy the prostate was found converted into a sarcomatous mass. Numerous deposits were found in the lungs, liver, the wall of the thorax, the outer surface of the cranium, and the whole extent of the spinal canal, between the dura mater and periosteum. Microscopically, the growths were proved to be round-celled sarcomata.

The following case of Angeio-sarcoma or Endothelioma intravasculare of the erectile tissue was described by Maurer (Kaufmann). The patient, aged fifty, was admitted into Professor Volkmann's Clinic with swellings in both groins, which had been incised. The penis was swollen as if half erect, of extreme solidity, and wooden hardness; its shape, however, was quite unchanged.

In the groins were sloughy ulcers. Secondary deposits of the size of a cherry were found over the dorsum of the right foot, at the inner side of the right knee, and on the left leg. The patient sank within a month, numerous small nodules having appeared in the skin throughout the body. At the necropsy both the corpora cavernosa and the corpus spongiosum were infiltrated with masses of sarcoma cells, round and spindle-shaped. In the neighbourhood of the glans and the bulb it was possible to make out clearly that these cells originated in the endothelium of the cavernous tissue.

The **characters** of sarcomata of the erectile tissues of the penis will be gathered from the above cases. The only **treatment** is extirpation of the penis.

Melanotic Sarcoma.—A few cases of this disease have been recorded. A case is given by Mr. Holmes (*Path. Soc. Trans.*, vol. xxiii. p. 175). The patient, aged fifty-two, had noticed eight years before a small, hard black spot at the end of the penis which slowly and gradually increased. Two years before, this had burst, and, latterly, had increased rapidly. On the end of the glans was an indurated, black sore, with a thin fluid oozing from it. There was considerable induration for some distance along the urethra and slight pain and some burning during micturition. The groin glands were very slightly enlarged. The patient recovered after amputation. A rather large mass of melanotic material was found round the meatus, and several smaller detached masses springing from the mucous membrane of the urethra, along about an inch of its course. Microscopically, the growth was a melanotic spindle-celled sarcoma.

The following excellent account of a case of melanotic sarcoma of the penis is given by G. Fisher (*Deuts. Zeitschr. f. Chir.*, 1887, Bd. xxv. S. 313). It is a good instance of the almost certain recurrence which accompanies this variety of malignant disease.

The patient, aged fifty-three, who entered the hospital at Hanover, April 1886, had noticed some blue spots on the left side of the glans nine months before. Micturition had become difficult with a small twisted stream. The blue spots extended, and swelling of the scrotum and indurated glands in each groin had also been perceived. On admission the penis was curved slightly upwards, and paraphimosis was present. The prepuce and glans were hard to the touch. By the meatus, on the glans, behind the corona and on the lower surface of the penis from the frænum to the middle of the organ, were blue-black spots variable in size and extent. On the glans and behind it they were in small masses the size of lentils, and formed no projection above the surface; at the meatus, and on the under surface of the penis, they formed hard elevated nodules as big as a pea. In no part was there ulceration, but the mucous membrane of the meatus bled alone at the slightest touch. Along the middle of the dorsum of the penis was a long hard subcutaneous cord. The skin of the penis was mobile, that of the scrotum œdematous. In both groins were enlarged glands, slightly movable and covered with normal skin. Micturition took place drop by drop, and was painful. The urine, of a clear yellowish-brown colour, deposited a sediment rich in red blood-corpuscles. The penis was amputated April 31, 1886. The inguinal glands were also extirpated, these were very adherent, the right femoral vein and the left saphena being wounded. On the interior of some of the small vessels blackish points were perceived. A melanotic cord which ran from the groin to the iliac fossa was tied and cut as deeply as possible. June 20 the patient went out, the wounds being healed. November 23 he returned with recurrence, and stated that two months after his discharge he noticed fresh spots. There was no local return. The pubic region and the inner surface of the right thigh were covered with melanotic stains and nodules. There was a hard swelling in the right iliac fossa. The history was carried up to February 4, 1887, when it was noted that there was no further change.

Examination of the amputated specimen showed that the new growth was a melanotic sarcoma, the pigment being, as usual, very unequally distributed. Orth, who made the microscopical examination, was of opinion that the growth began in the urethral mucous membrane.

SECONDARY MALIGNANT DISEASE OF THE PENIS.

These may be instances of sarcoma or carcinoma secondary to mischief elsewhere. They are of but slight surgical importance.

ii. **Secondary Sarcoma of the Erectile Tissue.**—In a case of C. O. Weber's hard pea-shaped nodules were found in the corpora cavernosa, and several just below the glans, under the prepuce. There was some difficulty in micturition, relieved by the use of the catheter. Here the deposits in the penis were secondary to a primary sarcoma of the testicle.

Secondary Carcinoma of the Erectile Tissue.—In the following cases of Holmes Coote and Neumann, the deposits in the erectile tissue of the penis are thought by Kaufmann to have been secondary to a primary carcinoma of the bladder. In the first (*Trans. Med. Chir. Soc.*, vol. xlvii. p. 1) the patient, aged fifty-five, had noticed difficulty of micturition for eighteen months; catheters had been passed causing much pain. For eight months a nodular swelling had been noticed on the tibia. On admission there was phimosis, and from under the prepuce there flowed, on pressure, a sero-purulent fetid discharge. The penis was rigid, of incompressible hardness, and bent on itself with its concavity directed upwards. Much pain was present. When the prepuce was slit up, the glans was found to be nodulated, hard, and superficially ulcerated. The patient became drowsy and comatose twenty-four hours before his death. The disease apparently ran its course in about a year and a half.

At the necropsy, while the skin of the penis was normal, the corpora cavernosa were distended to their uttermost by the infiltration of a semi-fluid creamy deposit; this fluid exuded from the surface as a thick juice, containing, microscopically, nucleated cells, mostly elongated and caudate, and very similar to those of scirrhus of the breast. The corpus spongiosum were infiltrated with similar deposit. On more minute examination it was found that the cells were chiefly within the venous sinuses, the walls of the trabeculæ being also infiltrated. The urethra, though compressed throughout, was normal within. There were deposits of "cancer" around the bulb and the prostate gland. A large circular ulcer, with ragged, elevated and indurated edges, was found on the mucous membrane of the bladder, close to the orifice of the right ureter. This was thickened, and the right kidney reduced to a sac of dilated pelvis. The left organ was enlarged. The iliac, lumbar, and bronchial glands were infiltrated with malignant disease. The swelling on the tibia, and similar ones connected with the tarsus and tendon-sheaths of the right foot were found to be malignant.

Owing to the deficient early history, it must remain doubtful whether in this case the primary disease was of the penis or bladder. It is noteworthy that at the commencement the trouble was connected with micturition, and it would appear probable that if disease sufficient to cause this had then existed in the penis, this organ would have been amputated at this time. Furthermore the destruction of the right kidney points to a long existing trouble in the bladder.

In a case of Eberth's quoted by Kaufmann, the primary mischief was a carcinoma of the rectum, and a secondary nodule, larger than a cherry-stone, was found in the erectile tissue of the bulb, having apparently formed there as a thrombosis. In a case of Neumann, also quoted by Kaufmann, the primary carcinoma was in the bladder and prostate. Thrombi of similar structure were found in the pudic veins, in the dorsal vein, and in the deep veins of the penis.

INDEX OF SUBJECTS.

ABDOMINAL hæmatocele, 245
    hydrocele (*q.v.*), 171
    retention of testis, 30, 31
        with hernia, 43, 74, 76
    ring, external, in retention of testis, 39
Abnormalities, congenital, of testis, 21
    in development of testis, 21
        of annexa, 24
    of penis, 619
    of prepuce, 621
    of position of testes in scrotum, 93
    of vesiculæ seminales, 24, 27, 591
Abscess of penis, 669
    of testis, 261, 285
        after lithotomy, 264
        after lithotrity, 263, 499
    translucent, 118
    vas deferens, along, 261
    of cord, 499
    of vesiculæ seminales, 596
Absence of epididymis, 24, 26
    of external genitals, 28
    of penis, 609
    of prepuce, 644
    of scrotum, 28
    of seminal apparatus, 25
    of testes, 23
    of vas deferens, 24, 26
    of vesiculæ seminales, 25, 26
Acquired phimosis, 638
    syphilitic orchitis, 304
Acupuncture (of hydrocele), 139
    in œdema of scrotum, 545
Acute gout of penis, 684
Acute hydrocele, 98
        and epididymitis, 255
        and pleurisy, &c., 99
        its pathology, 100
        in specific fevers, 98
        treatment, 100
    in tonsillitis and orchitis, 297
    in tubercular disease of testis, 345
Adhesion of penis to scrotum, 613
    adhesions after paraphimosis, 642
    adhesions in phimosis, 621
Age in malignant disease of testis, 397; of penis, 717
Ague and orchitis, 289
Amputation of penis, 726
        by cautery, 729
        circular method, 728
        flap method, 726
        and hæmorrhage, 728
Anatomy of spermatic veins, 521
Aneurism and atrophy of testicle, 446
    of dorsal artery, 692
Angeiomata of penis, 692, 702
    of scrotum, 565
Angeio-sarcoma of penis, 741
Annexa of testis, abnormal, 24
Anorchism, 23
    bilateral, 27
    influence of, 28
    and impotence, 484
Antiseptic incision of hydrocele, 154
Arrest of development of testis, 444, 449
            (ectopic), 68
        and varicocele, 447
Aspermia, 493
    anæsthetic, 495
    atonic, 495
    congenital, 493
    from stricture or spasm of ejaculatory ducts, 493, 495
    psychical, 495
    from stricture of urethra, 494
    treatment, 496
Atonic impotence, 485
Atrophy of testis, 268, 280, 286, 444
            and aneurism, 446
    causes, elephantiasis scroti, 580
        epididymitis, 268
        hæmatocele, 223
        head injury, 447
        double hydrocele, 133
        iodine, 448
        local, 444, 446
        masturbation, 445
        mumps, 280
        of nerve origin, 447
        epididymo-orchitis, 208
        remote, 446
        senile, 448
        sexual excess, 445
        disease of spinal cord, 447
        syphilis, 310
            congenital, 313
        ill-fitting trusses, 446
        typhoid orchitis, 286
    retained testis, 62
    morbid anatomy, 449, 450
    neuralgia in, 450
    of vesiculæ seminales, 592
Attachments of gubernaculum, 6
Azoospermia, 490
    from obstruction in epididymis and vas, 491

- Azoospermia from presence of pus, 492
  - from affections of testicle, 490

- Bacilli of tubercle, entrance of, 323
  - in infants, 327, 374
- Balanitis or balano-posthitis, 651
  - catarrhal, 654
  - circumcision in, 658
  - croupous, 654
  - diabetic, 657
  - diphtheritic, 654
  - and epithelioma, 718
  - gouty, 655
  - and herpes, 663
  - "perstans," 656
  - and phimosis, 623, 654
  - pre-cancerous, 656
  - venereal, 652
- Ballooning of prepuce, 646
- Bifid penis, 619
- Bilocular hæmatocele, 245
  - hydrocele, 112, 171
    - symptoms, 173
    - treatment, 173
- Bodies loose in tunica vaginalis, 211
  - structure, 213
  - symptoms, 214
- Bone in carcinoma testis, 391
  - penis, 682
- Boys, advice to, on sexual matters, 459

- Cæcocele, congenital, 4
- Calculi, preputial, 623, 646, 647
  - scrotal, 589
- Calculus (renal) and irritable testis, 454
- Cancer of scrotum (*vide* Epithelioma), 552
  - and trades, 559-561
  - treatment, 562
- Cantharides and priapism, 695
- Carbolic acid injection of hydrocele, 145
    - method, 148
  - poisoning, 148
  - and cancer scroti, 561
- Carcinoma of penis, epithelioma, 707
    - metastatic, 744
  - of testis, 384
    - and adipose tissue, 391
    - with bone, 391
    - with cartilage, 391
    - cystic, 390
    - degeneration cysts, 387
    - diagnosis, 402-405
    - and epididymis, 388
    - generalisation of, 388
    - and hæmatocele, 388
    - hæmatodes, 391
    - and hernia testis, 387
    - medullary, 385
    - melanotic, 391
    - microscopical structure, 389
    - mixed, 391
    - reticulated, 390
    - scirrhus, 389
    - starting-point, 385, 386
    - and tunica vaginalis, 388
      - (also *vide* "Scirrhus")
      - (also *vide* "Malignant Disease")
  - of vesiculæ seminales, 608
- Cartilage and bone in penis, 682
- Cartilaginous bodies in the tunica vaginalis, 211
- Caseation in tubercular disease, 342
- Castration, 437
  - and inguinal hernia, 437
  - in cancer of scrotum, 562
  - in cystic disease, 429
  - in enchondroma, 416
  - in epithelioma of penis, 731
  - in fibroma, 418
    - of tunica vaginalis, 435
  - in growths of cord, 519
  - in hæmorrhage in, 441
  - in hernia testis, 381
  - in malignant disease, 406
  - in myxoma, 419
  - in neuralgic testis, 455
  - in onanism and insanity, 476
  - in retained testis, 68
  - in sarcoma of scrotum, 574
    - of tunica vaginalis, 436
  - in teratomata, 432
  - in tubercular disease, 366, 370, 372
  - in peritonitis after, 441
- Catarrhal balanitis, 654
  - herpes, 659
- Cautery for amputation of penis, 729
  - for tubercular testis, 366
- Cavernitis, 670
- Cellulitis after circumcision, 634
  - of penis, 667, 668
    - and abscess, 669
  - of scrotum, 545
  - after tapping a hydrocele, 137
- Chancres originating epithelioma, 718
- Chimney-sweep's cancer, 552, 559, 560, 561
  - (*vide* Epithelioma)
- Chondroma of scrotum, 574
    - testis (*vide* Enchondroma)
- Chromic acid for warts, 705
- Chronic induration of erectile tissue of penis, 678
- Chylous hydrocele, 176
  - causes—degenerative, 181
    - gonorrhœal lymphangitis, 180
    - parasitic, 177
    - traumatic, 179
  - pathology, 176
  - treatment, 184
- Cicatrices and cancer, 552
  - of scrotum, 552
  - of penis, 718
  - and neuralgia of testis, 452
- Circumcision, 629
  - for acquired phimosis, 640
  - complications, 634
  - for diabetic balanitis, 658
  - dressing for, 633
  - for elephantiasis, 701
  - treatment of frænum in, 63
  - for herpes, 664
  - for horns, 703
  - for malignant disease, 726
  - for syphilis, 635
  - for tubercle, 637
- Classification of hydroceles, 101
  - of new growths of testis, 385
- Climate and elephantiasis, 576
- Cohnheim's theory, 385
- Coitus and paraphimosis, 640

Coitus and tubercle, 323
Colico-spermatic veins, 521
Concealment of penis, 610
Concretions and aspermia, 494
  in vesiculæ seminales, 603
Congenital abnormalities of testis, 21
  adhesion of penis, 613
  fistula of penis, 617
  hydrocele, 162
    complications, 167
    symptoms, 165
    treatment, 168
      operative, 169
    with hernia, 167
  syphilis and orchitis, 312
Continence, 463
Contracted meatus and epididymitis, 251
Cord in enchondroma, 411
  in epididymitis, 260
  hydrocele of, acute, 500
    diffuse, 501
      and omental hernia, 501
    encysted, 502
      becoming a hæmatocele, 505
      and hernia, 504
      origin in extravasation of blood, 503
      and hernial sac, 503
      organ of Giraldès, 503
      processus funiculo-vaginalis, 502
      treatment, 505
  hæmatocele, diffuse, 508
    encysted, 510
    treatment, 512
  inflammation of, 498
    acute, 498
      and peritonitis, 498
    chronic, 499
    syphilitic, 499
  ligature of, 439
  fibroma of, 516
  lipoma of, 17, 513
  myoma, 519
  myxo-chondro-sarcoma, 517
  myxo-lipoma, 515
  myxoma, 516
  myxo-sarcoma, 517
  new growths, 513-519
    treatment, 519
  and retained testis, 42
  sarcoma, 517
  torsion of, 55, 56
    and hernia, 57
Corpus Highmorianum, 15
  innominatum and cysts, 197
Cowper's glands, inflammation of, 669
  and cavernitis, 670
Cremaster, anatomy of, 9
  and retention of testis, 41
Croupous balanitis, 654
Crural ectopia, 6, 36
  treatment, 92
Cruro-scrotal retention, 30, 34 ; with hernia, 74
Crus, sarcoma of, 740
Cryptorchids, 28, 29
  efficacy of testes in, 45
Cure, radical, of hydrocele, 140
Curvature of penis, 483
Cutaneous diseases of penis, 665
Cystic carcinoma, 390
  disease of testis, 420
    starting-point, 425
    minute anatomy, 423, 426
    recurrence, 429
    symptoms, 428
    and Wolffian body, 427
  tumours of scrotum, 568
Cysto-sarcoma of testis, 395, 420, 424
  structure, 424
Cysts of bladder, 601
  and corpus innominatum, 197
  dermoid, 429
  epididymis (*q.v.*), 186, 190
  and hydatid of Morgagni, 198
  and hydrocele, 125
  and Müller's duct, 198
  and organ of Giraldès, 197
  parovarian, 198
  parepididymis, 197
  sebaceous, of penis, 702
    of scrotum, 566
  hydatid (scrotum), 570
  urinary, 570
  vas aberrans, 199
  of vesiculæ seminales, 600
    and Müller's duct, 601
Cysts on base of bladder, 601
Cystoid lymphangeioma, 127

DEGENERATION (fatty) of testis, 450
Dermoid cysts, 429
  origin, 431
  and testis, 430
  treatment, 432
Development of cremaster, 3
  genital eminence, 1
  gubernaculum, 4
  kidneys, 2
  mesorchium, 1, 3
  pelvis, 2
  plica gubernatrix, 3
    vascularis, 3
  of prepuce, 621
    deficient, 644
  processus vaginalis, 3
  scrotum, 3
  spine, 2
  testis, 1
    arrest of, 444, 449
    abnormal, 21
    ectopic, 62
    errors in, 14
    annexa, 24
Diabetes and impotence, 485
  and induration of penis, 680
Diabetic balanitis, 657
Dilatation of lymphatics, 699
  of prepuce, 629, 646
  of vesiculæ seminales, 600
Diphtheritic balanitis, 654
Diseases (*vide* Parts affected)
Discharge, urethral, in tubercular disease, 346
Division, congenital, of prepuce, 644
Dorsal incision (phimosis), 629
Double penis, 482, 615
Drainage of hydrocele, 158
Dressing for circumcision, 633

- Dressing for amputation of penis, 729
- Drugs and impotence, 485
- Duct, Wolffian, 15
  - of Müller, 15, 198
    - cysts arising from, on base of bladder, 601

- ECTOPIA of testis, 29, 34
  - (*vide* Testis misplaced)
  - crural, 6, 37
    - treatment, 92
  - cruro-scrotalis, 30, 34
  - perinæal, 6, 35
    - treatment, 91
  - peno-pubic, 35, 38
- Ectopic testis, functional efficacy, 45
  - structure, 45
  - transplantation, 83
- Eczema of penis, 666
- Edinburgh tincture of iodine, 142
- Ejaculation, physiology of, 481
- Ejaculatory ducts, stricture, 493
- Electricity and impotence, 488
  - and neuralgic testes, 455
- Elephantiasis of penis, 700
  - of scrotum, 576
    - and atrophy of testis, 445
    - causes, 578
    - climate, 576
    - filaria, 577
    - histology, 576
    - and impotence, 483
    - inguinal glands, 580
    - operation, 581
      - complications, 582
    - symptoms, 580
    - syphilis, 578
    - treatment, 581
- Eminence, genital, 1
  - sexual, 1
- Emissions, seminal, 466
  - and epididymitis, 259
  - and herpes, 659
- "En bissac" hydrocele, 112, 171
- Enchondroma of testis, 409
  - mixed, 412
    - in early life, 414
    - recurrence, 415
    - treatment, 416
  - pure, 410
    - anatomy of, 410
    - commencement, 411
    - cord in, 411
    - degenerations, 410
    - epididymis, 411
    - tunica vaginalis, 410
- Encysted hæmatocele of testis, 240
  - (*vide* Testis and Cord)
  - hydrocele, 123, 124
    - of epididymis, 186, 190
      - (*vide* Epididymis)
    - of testis, 184, 202
      - (*vide* Testis)
- Endothelioma of penis, 741
- Entrance of tubercular bacilli into genitals, 323
- Epididymis, absence of, 24, 26
  - carcinoma, 388
  - development, 2
  - enchondroma, 411
  - encysted hydrocele of, 185
- Epididymis, encysted hydrocele of,
    - large parenchymatous cysts of, 190
      - pathology, 192
      - symptoms, 203
      - treatment, 205
    - small, subserous, 186
      - pathology, 187
  - hæmatocele of, 243
  - and hydrocele, 114, 133
  - abnormal, a cause of retained testis, 43
  - lymphadenoma, 408
  - malignant disease, 396
  - new growths, 384
  - nodules and neuralgia, 452
  - position in tubercular disease, 362
  - syphilitic disease of, 311
  - tail, induration of, 333, 353, 354
  - in tubercular testis, 331
- Epididymitis, or epididymo-orchitis, 248
  - and atrophy of testis, 268, 444
  - bilateral, 259
  - causes, 248-251
  - in children, 278
  - complications, 260
    - abscess, 261, 263, 264
    - gangrene, 265
    - peritonitis, 266
    - pseudo-strangulation, 267
    - suppuration, 260, 261
  - cord, the, in, 260
  - and cellulitis of scrotum, 546
  - pathological anatomy, 253
  - symptoms, 256
  - terminations, 267
  - and retained or misplaced testis, 260
  - and seminal emissions, 259
  - from strain, 298
  - syphilitic, 311
    - and tubercular, 355
    - and obstruction of semen, 267, 276
  - treatment, 269
    - by leeches, 272
    - by puncture, 271
  - varieties of, 259
  - vesiculæ seminales in, 259
  - tubercular, 321
    - acute, 344
      - symptoms, 345
      - diagnosis, 347, 356
    - commencement, 341
    - microscopical, 341
    - morbid anatomy, 331
    - syphilitic, 355
- Epispadias and impotence, 483
  - and sterility, 496
- Epithelioma of penis, 707
    - age, 717
    - causes, 717
      - balanitis, 718
      - question of infection, 721
      - injury, 720
      - irritation, 718
      - phimosis, 627, 717
      - scars, 718
      - venereal disease, 717
    - commencement, 707
      - fistula, 709

Epithelioma of penis, commencement,
      pimple, 708
      raw patch, 708
      in scrotum, 709
      ulcer, 709
      urethra, 709
      wart, 708
    diagnosis, 722
      with phimosis, 724
    extension, 712
    and gummata, 689
    inguinal glands, 713, 727
      inflammation, 715
    in Jews, 717
    metastasis, 716
    micturition in, 721
    pre-cancerous *plaques*, 720
      stage, 725
    symptoms, 721
    treatment, 724
      circumcision, 726
    ulceration in, 710
    urethra in, 713
    vegetations, 709
  of scrotum, 552
    chimney-sweep's, 552, 559, 561
    frequency, 559, 560
    heredity, 558
    inguinal glands, 554, 557
    localisation, 555
    relation of dirt to, 558
    occupations, 559, 561
    and papilloma, 553
    pre-cancerous, 556
    scars, 553
    subcutaneous nodule, 554
    treatment, 561
    warts, 553
Erasion in tubercular testis, 364
Erectile tissue growths, 738
  induration, 678
    cause, 678, 681
    treatment, 682
  inflammation, 670
  sarcoma, 740, 741
Erection, physiology of, 478
Errors in development, 14
  in transit of testis, 14
Erysipelas and circumcision, 634
  and hernia testis, 377
  and acute hydrocele, 99
  of penis, 668
  and peritonitis, 498
  of scrotum, 545
Excision of horns, 703
  of sac of hydrocele, 150
  of varicocele, 538–541
External genitals, abnormalities of, 27, 28
Extirpation of penis, 726, 734
  arrest of hæmorrhage in, 735
Extra-vaginal hæmatocele, 549
Extravasation of blood and hydrocele, 503
      and varicocele, 533
  urine and gangrene of scrotum, 546
      and hernia testis, 377

FALSE membranes in tunica vaginalis, 104
Fatty hydrocele, 176
Fevers and atrophy of testis, 280, 285, 444
  and gangrene of penis, 672
Fevers and gangrene of scrotum, 547
  and acute hydrocele, 98
  scarlet fever and orchitis, 288
Fibroma of cord, 516
  of scrotum, 572
  of testis, 417
  of tunica vaginalis, 434
Fibro-myxoma of scrotum, 572
Fibro-sarcoma of testis, 394
Fibrous bodies in tunica vaginalis, 211
  thickening of penis, 679
Filaria sanguinis hominis, 177, 577, 587
Fistula after opening hæmatocele, 233
  of urethra and epithelioma, 709
      congenital, 617
  scrotal, 589
  urinary, after paraphimosis, 642
Fluid of hydrocele, 107
Fœtal inclusions, 429
  relics, 15
  peritonitis, 16, 33, 39
  veins and varicocele, 529
Fœtus, tubercular testis in, 327
Frænum in circumcision, 630
  shortness of, 644
Function of gubernaculum, 7
  of testis, 465
Functional efficacy of ectopic testicle, 45
Fungus testis (*vide* Hernia Testis), 377
  in carcinoma, 387
Fungus of diabetic balanitis, 657
Fusion of testicles, 15

GANGRENE after epididymitis, 265
  after removal of groin-glands, 738
  after tapping hydrocele, 137
  of misplaced testis, 54, 55
  from torsion of cord, 55
    of penis, 671
    causes, 672, 674
    complications, 675
    hæmorrhage, 675
    pyæmia, 625
    spontaneous, 675
    treatment, 676
    and urethra, 675
  of scrotum, 545
    causes, 137, 546, 547
    symptoms, 547
    treatment, 548
"Gangrène foudroyante," 547, 675
Genital eminence, 1
Genitals, external, abnormalities, 27
Giant-celled sarcoma of testis, 395
Giraldès, organ of, 15, 197
  and hydrocele of cord, 503
Glands in elephantiasis scroti, 580
  in lymph-scrotum, 586
  epithelioma penis, 713
  epithelioma, primary of, 557
  gangrene, 738
  in malignant scrotum, 554, 557
      testis, 400
  removal of, 726, 737, 738
Gliomatous sarcoma of testis, 395
Gonorrhœa and atrophy of testis, 445
  and epididymitis, 249, 256
  and induration of penis, 681
  and vesiculæ seminales, 593
Gout and epididymitis, 250, 276, 292
  of penis, acute, 684

Gout and priapism, 695
Gouty balanitis, 655
    and epithelioma, 656, 719
    herpes, 661
    induration of penis, 678
    orchitis, 292
Granulo-sarcoma of testis, 395
Growths of cord, 513
    of erectile tissue, 738
    of penis, 700
    of scrotum, 552, 562, 565
    of tunica vaginalis, 384, 433
    of vesiculæ seminales, 608
Gubernaculum testis, 4, 5, 6
    pathological conditions, 16, 40
Gubernatrix plica, 3, 5
    preventing transit of testis, 16
Gummata of corpora cavernosa, 689
    of penis, 688
        and epithelioma, 718
        treatment, 689
        and urethra, 689

HÆMATOCELE, 215
    cause, 215, 221, 227
    complications, 232
    contents, 223
    course, 232
    diagnosis, 234
    fistulæ, 233
    and hydrocele, 227
    and malignant disease, 233
    persistent swelling, 232
    subcutaneous rupture, 233
    symptoms, 230
    testis in, 225, 226, 445
    treatment, 236
        radical, 237
    walls of, 221
    abdominal, 245
    bilocular, 245
    of cord (*vide* Cord), 508
    encysted, of testicle, 240
    extra-vaginal, 550
    and hernia, diagnosis, 122
    and malignant disease, 404
    parenchymatous, 241
    scrotal, 245, 549
    of substance of epididymis, 243
    varieties, 215
Hæmorrhage into hydrocele, 137
Head injury and atrophy of testis, 447
Heredity and epithelioma scroti, 558
    and tubercular testis, 327
Hernia projecting into hydrocele, 128
    and encysted hydrocele, 129
    and hydrocele, 17
        congenital, 167
        diagnosis between, 120
    and impotence, 483
    omental, 501, 533
    and phimosis, 17, 623
    and retained testis, 78
    and torsion of cord, 57
    translucent, 118
Hernia testis, 377
    in carcinoma, 387
    causes, 377, 383
    erysipelas, 377
    extravasation,
    injury, 383
Hernia, sloughing, 383
    syphilitic, 310, 381
        treatment, 382
            surgical, 383
    tubercular, 377
        anatomy, 379
        starting-point, 377, 378
        symptoms, 380
        treatment, 381
        tubules in, 380
Herpes progenitalis, or præputialis, 659
    catarrhal, 659
        and circumcision, 664
        diagnosis, 663
        and gout, 661
        recurrence, 661
        seminal emissions, 659
        treatment, 663
            of recurrence, 664
        and venereal disease, 661
    zoster, 659
Hip disease and masturbation, 625
Horns of penis, 703
Hydatid of Morgagni, 15, 202
        and cysts, 198
    of scrotum, 570
Hydrocele, 97
    abdominal, 112, 171
    and atrophy of testis, 114, 133
    acute (*vide* Acute), 98
    bilocular (*vide* Bilocular), 112, 171
    classification, 101
    congenital (*vide* Congenital), 162
    of cord (*vide* Cord), 500
    en bissac (*vide* Bilocular), 112, 171
    encysted, of epididymis (*vide* Epididymis), 185, 186
        of testis, 184, 202
    false membranes, 104
    fatty (*vide* Chylous), 176
    and gangrene, 137, 546
    and hernia, 17, 127
    of hernial sac, 207
    and impotence, 483
    and sterility, 134
    infantile, 169
    in malignant disease, 399, 405
    multilocular, 112
    and retained testis, 42, 62
    in tubercular testis, 338, 339
    vaginal, common causes, 102
    complications, 123
        multiple, 123
    and encysted hydrocele, 124
    and cysts, 125
    and hernia, 127
    course, 130
        rupture, 131
        spontaneous cure, 130
        suppuration, 132
        transformation into hæmatocele, 133
    diagnosis, 120
        from hernia, 120
        with hernia, 121
        from hæmatocele, 122
        from malignant disease, 122
    epididymis in, 114, 133
    fluid, 107, 108
    partial, 110

Hydrocele, primary idiopathic, 103
  scrotum and tunica vaginalis in, 109
  secondary symptomatic, 13
  symptoms, 116
  testis in, 114, 115, 133
  theories of, 103, 105, 108
  treatment, acupuncture, 139
    choice of, 158
    drainage, 158
    incision, 150
    injection, 140
      with carbolic acid (*q.v.*), 145
      with iodine, 140, 153
    radical, 140
    setons, 160
    silver nitrate, 150
    tapping, 134
      complications, 136
    various methods, 162
  and truss, 102
  tunica albuginea in, 109
    vaginalis in, 109, 112
  of vesiculæ seminales, 602
Hypertrophy of testis, 443
Hypochondriasis, sexual, 468
  and castration, 477
  and marriage, 475
  treatment, 470
    local, 473
Hypospadias and impotence, 483
  and sterility, 496

ILIAC retention of testis, 30, 32
Impotence, 478
  atonic, 485
  causes, 481, 484
  and diabetes, 485
  organic, 482
  psychical, 486
  symptomatic, 484
  and syphilis, 316
  treatment, 487, 489
Incision for hydrocele, 150
  operation, 154
Incomplete transit of testicle, 29
Induration of epididymis, 333, 353, 354
  of penis, 678, 681
    syphilitic, 681
Infantile hydrocele, 169
  penis, 619
Infants, enchondroma in, 414
  masturbation in, 497
  syphilitic orchitis in, 314
  tubercular disease, 327, 373
Infection and tubercle, 330
  and cancer, 721
Inflammation of cord (*q.v.*), 498
  of testis and epididymis, 248
  of vesiculæ seminales (*q.v.*), 591
Influenza and orchitis, 289
Inguinal retention of testicle, 30, 33, 50
  canal, 40
  glands (*vide* Glands), in malignant disease of testis, 407
  in epithelioma of scrotum, 555
  in epithelioma of penis, 713, 737
Injections for hydrocele (*q.v.*), 140
  and epididymitis (*q.v.*), 251
Injury and atrophy of testis, 444
Injury and induration of penis, 680
  and malignant disease, 396, 720
  and priapism, 693, 695
  and tubercular testis, 329
Intra-testicular hæmatocele, 241
Intermittent fever and gangrene of penis, 673
Inversion of testis, 93
  causes, 94
Involution of varicocele, 536
Iodine injections, 140 ,153
  and atrophy of testis, 448
  in cavernitis, 671
  in gangrene of penis, 677
Irritable testis, 452
  causes, 453
  treatment, 454

"*Jabot sous-préputial*," 642
Jews and epithelioma penis, 717
Jewish circumcisions, 635, 637

KIDNEY, in anorchism, 28
  in tubercular testis, 341

LEECHES, in epididymitis, 272
Leprosy of penis, 666
Lesions of nutrition of testis, 443
Leucorrhœa and balanitis, 652
Leukæmia and priapism, 693
Ligature of cord, 439
Lipoma of cord, 17, 513
  scrotum, 574
  tunica vaginalis, 433
Lithotomy and epididymitis, 250
  and abscess of testicle, 264
Lithotrity and epididymitis, 250
  and abscess of testicle, 263
  and inflammation of cord, 499
Loose bodies in tunica vaginalis, 211
Lupoid ulceration of penis, 665
Lymph-scrotum, 585
    filariæ in, 587
    treatment, 588
Lymphadenoma testis, 408, 409
Lymphangitis of penis, 667
    diffuse, 668
Lymphatics of penis, 714
    dilatation, 699
    scrotum, 546

MALARIA and orchitis, 289
Mal-emission, 496
Malignant disease of penis, 707
    (*vide* Epithelioma, &c.)
  of scrotum, 552
    (*vide* Epithelioma, &c.)
  of testis, 396
    diagnosis from hæmatocele, 233, 388, 404
      from hydrocele, 405
      from sarcoma, 402
      from syphilis, 402
      from tubercle, 355, 403
    ectopic, 65
    extension of, 407
    and glands, 400
    and hydrocele, 399
    onset, 396
    pain, 401

- Malignant disease of testis, recurrence, 407
    - retained, 68, 69
    - symptoms, 398
    - theories of, 396
    - treatment, 406
- Marriage and sexual hypochondriasis, 475
- Masturbation, 457
    - and atrophy of testis, 446
    - in boys and men, 458, 463
        - treatment, 459
    - in children, 457
        - treatment, 458
    - exercise in, 462
    - and hip disease, 625
    - and phimosis, 624
    - at schools, 462
    - and stricture, 485
- Melanotic carcinoma (testis), 391
    - growths of scrotum, 562
    - sarcoma (testis), 395
        - of penis, 742
- Membranes, false in hydroceles, 104, 111
    - in hæmatoceles, 217
- Menstruation and balanitis, 652
- Meso-phlebitis and varicocele, 530
- Mesorchium, absence of, 56
    - and non-transit of testicle, 16, 31
    - and retained testicle, 43
- Metastasis, 251, 716
    - in carcinoma, 744
    - and penis, 743
    - and sarcoma, 743
- Misplaced testis (*vide* Testis)
- Mixed carcinoma, 393
    - enchondroma, 412
- Mobility of fœtal testis, 2
    - in later life, 18
- Monorchism, 23
- Morgagni, hydatid of, 15, 198, 212
- Muleteers and cancer scroti, 558
- Müller's duct, 15, 198
    - and cysts of vesiculæ seminales, 601
- Multilocular hydrocele, 112
- Multiple hydrocele, 123
- Mumps and atrophy of testis, 280, 444
    - and epididymitis, 275
    - and gangrene of scrotum, 546
    - and hydrocele, 99
    - and inflammation of retained testicle, 62
    - and orchitis, 278
- Myoma of cord, 519
    - testis, 419
- Myxo-chondro-sarcoma of cord, 517
- Myxo-lipoma (cord), 515
- Myxoma of cord, 516
    - testis, 418
- Myxo-sarcoma oi cord, 517
    - testis, 394

- NÆVUS of penis, 692
    - of scrotum, 565
- Nerve lesions and atrophy of testis, 447
- Nitric acid and warts, 705
- Neuralgia of penis, 686
    - of testis (*vide* Irritable Testis), 452
        - and atrophy, 447, 450
        - and varicocele, 454, 533
- New growths (*vide* Growths, &c.)
- Nocturnal emissions, 466
- Nutrition of testis, 443
- Nutrition of testis, retained, 45
    - and varicocele, 447, 525, 534

- OCCUPATIONS and cancer of scrotum, 559, 561
- Œdema of penis, 650
    - of scrotum, 544, 545
- Omental hernia (*vide* Hydrocele of Cord), 501
    - (*vide* Varicocele), 533
- Orchidopexy, 83
- Orchitis (*vide* Epididymo-orchitis), 302
    - treatment, 304
    - with ague, 289
    - and gout, 292
    - and influenza, 289
    - and malaria, 289
    - and mumps, 278
    - rheumatic, 295
    - and scarlet fever, 288
    - and small-pox, 287
    - strumous (*vide* Tubercular), 321
    - syphilitic, acquired, 304
        - congenital, 312
        - diagnosis, 316
        - gummatous, 308
        - hernia, 310
        - interstitial, 304
        - pathology, 304
        - symptoms, 313
        - termination, 309
        - treatment, 318
    - and tonsillitis, 297
    - tubercular (*vide* Tubercular Testis), 321
    - and typhoid, 284
- Organ of Giraldès, 15, 197
- Organic impotence, 482
- Osteoma of scrotum, 574
    - of testis, 420

- PACHY-VAGINALITIS, 215
- Parenchymatous hæmatocele, 241
- Parepididymis, 197
- Parovarian cysts (and epididymis), 198
- Paget's disease of scrotum, 564
- Papilloma penis, 704
        - and malignancy, 705
        - treatment, 705
    - scrotum, 553
- Paraffin and cancer, 561
- Paraphimosis, 640
    - acute, 641
    - adhesions in, 641
    - chronic, 641
    - and coitus, 640
    - complications, 642
    - lumpy swelling, 642
    - treatment, 642, 643
    - and venereal disease, 641
- Penis, 609
    - abnormalities, 619
    - absent, 482, 609
    - bifid, 619
    - bone in, 682
    - concealment of, 610
    - curvature of, 483
    - double, 482, 615
    - epithelioma (*q.v.*), 707
    - fistula, 617
    - gangrene (*q.v.*), 671
    - gout, 684

Penis, gummata, 688
    infantile type, 619
    inflammation, 650
    lymphatics of, 714
    nævi, 692
    neuralgia, 686
    œdema, 650
    "palmée," 613
    papilloma (*q.v.*), 704
    sarcoma, 738
    shape abnormal, 619
    size abnormal, 619
    torsion, 612
    tubercle, 690
    webbed, 613
Penitis, 670
Peno-pubic ectopia, 35, 38
Pericarditis and hydrocele, 99
Perinæal ectopia, 6, 35, 61
    and castration, 441
Peritonitis and epididymitis, 266
    and erysipelas, 498
    fœtal, 16, 33, 39
    and retained testis, 43, 62
    and vesiculæ seminales, 596
Persistence of fœtal relics, 15
    and cysts, 197
Phimosis, acquired, 638
        treatment, 639
    congenital, 621
        and balanitis, 623, 654
        and calculi, 623
        and coitus, 626
        and epithelioma, 627, 717, 724
        and hernia, 17, 623
        and lymphangitis, 667
        and masturbation, 624
        and micturition, 622
        and paraphimosis, 626
        and posthitis, 626
        and prolapsūs ani, 624
        symptoms, 622
        treatment, 629
            dilatation, 629
            incision, 629
            circumcision, 629
        and uræmia, 623
        and venereal disease, 627
Phlebitis in varicocele, 533
Phtheiriasis, 665
Physical impotence, 482
Pleurisy and hydrocele, 99
Plica gubernatrix, 3, 5
    and transit of testicle, 16
Pneumonia and hydrocele, 99
Polyorchism, 21, 22
    in animals, 23
Posthitis (*vide* Balano-posthitis), 651
Pre-cancerous condition, 725
    plaques, 720
    stages, 556, 656
Prepuce, absence of, 644
    anomalies of, 621
    ballooning of, 646
    calculi, 623, 646
        composition of, 647
    development, 621
        deficient, 644
    dilatation, 646
    diseases of, 621
Prepuce, division of, 644
    hypertrophy of, 624
    and sterility, 645
Priapism, 693
    causes, 693
    in children, 695
    in leukæmia, 693
    symptoms, 695
    treatment, 696
Processus funiculo-vaginalis, 9, 11
    and hydrocele and hernia, 17
    and hydrocele of cord, 502
Prostate and epididymitis, 250
    in tubercular testis, 340, 352
Prostatic urethra and irritable testicle, 453
    and sexual hypochondriasis, 473
Pseudo-strangulation, 54, 258, 267
Puncture of testicle, 271
Psychical aspermia, 496
    impotence, 486

RADICAL cure of hydrocele, 140
        and tunica vaginalis, 159
    treatment of hæmatocele, 236
Relics, fœtal, 15
Raw patch in balanitis, 655
    and epithelioma, 708
Recruits and varicocele, 533
Removal of testis (*vide* Castration), 437
Renal calculus and irritable testis, 453
Retained testis and epididymitis, 260
        functional efficacy, 45
        with hernia ,78
        and hydrocele, 42, 62
        malignant, 68, 69
        and mumps, 62
        removal of, 68, 69, 78
        structure, 45
        synorchis, 43
        transplantation, 84
        truss for, 43, 83, 88
Retention of testicle, 29, 30, 31
    abdominal, 30, 31
    causes of, 39
    cruro-scrotalis, 30, 34
    iliac, 30, 32
    inguinal, 20, 33, 50
    relative frequency, 31
    complication, 49
    treatment, 43, 83, 88
Retention cyst theory, 192
Reticulated carcinoma (testis), 390
Reversion of testis, 95
Rheumatic orchitis, 295
Rheumatism and epididymitis, 276
    and hydrocele, 99
Ring for varicocele, 536
Rupture of hydrocele, 131
    of hæmatocele, 233
    of varicocele, 529

SARCOCELE (*vide* Orchitis), 304
Sarcoma of cord, 517
    of penis, 738, 741
        melanotic, 742
        and priapism, 695
    of scrotum, 572, 573
    of testis, 391
        (*vide* Carcinoma), 402
        minute structure, 393
        origin, 392

- Sarcoma of tunica vaginalis, 435
  - of vesiculæ seminales, 608
- Scarlet fever and orchitis, 288
  - and gangrene of scrotum, 547
- Scars and epithelioma, 552
- Scirrhus of scrotum, 552
  - of testis, 389
- Sclerosis of testis, 305, 449
- Scraping tubercular testis, 364
- Scrotum, absence of, 28
  - calculi, 589
  - cellulitis, 545
  - development of, 10
  - diseases of, 544
  - discoloration of, 59, 550
  - elephantiasis (*q.v.*), 576
  - epithelioma (*q.v.*), 552
  - erysipelas, 545
  - fistulæ, 589
  - hæmatocele, 245, 549
  - gangrene, (*q.v.*), 545
  - growths, 552
  - lymph, 585
  - malformation, 27
  - and misplaced testis, 43
  - œdema, 544, 545
- Sebaceous cysts of penis, 702
  - of scrotum, 566
- Seminal apparatus, absence of, 25, 26
  - emissions, 466
  - and epididymitis, 259
  - and herpes, 659
  - fluid, 480, 490, 492
  - tubules in hernia testis, 380
  - vesicles (*vide* Vesiculæ Seminales), 591
- Senile atrophy of testis, 47, 448
- Septum penis, bone in, 683
- Setons for hydrocele, 160
- Sexual excess and atrophy of testis, 445
  - and priapism, 693
  - hygiene, 463
  - hypochondriasis, 468
  - and marriage, 475
  - treatment, 470
    - local, 473
- Silver nitrate in hydrocele, 150
  - to prostatic urethra, 473
- Sloughing of epididymis (*vide* Testicle), 265
  - hernia testis, 383
- Small-pox and gangrene of penis, 673
    - of scrotum, 547
  - and hydrocele, 99
  - and orchitis, 287
- Soot and cancer, 561
- Spermatic cord (*vide* Cord), 498
  - veins, 521
- Spermatorrhœa, 466, 488
- Sphacelus of penis, 672
- Spinal injury and impotence, 485
- Spontaneous gangrene (penis), 675
- Spurious hydrocele of a hernial sac, 209, 211
- Sterility (*vide* Aspermia and Azoospermia), 478, 489
- Sterility and hydrocele, 134
  - and syphilis, 315
- Strain and epididymitis, 298
- Stricture and epididymitis, 250
  - and masturbation, 485
  - and sterility, 493, 494
- Structure of gubernaculum, 7
- Structure of retained testis, 45
- Strumous testis (*vide* Tubercular Testicle), 321
- Supernumerary testicles, 21
- Suppuration after carbolic injection, 146
  - in epididymitis, 260, 261
  - in hæmatocele, 232
  - in hydrocele, 132
  - after iodine injection, 144
  - in orchitis, 298
  - in syphilis of testicle, 310
  - in tubercular testicle, 350
  - in tunica vaginalis, 260
  - of vesiculæ seminales, 594, 597
- Suspender for varicocele, 536
- Suspensory ligament, bony tissue in, 683
- Sweep's cancer, 552
- Syme's treatment of hernia testis, 383
- Symptomatic impotence, 484
- Synorchism, 15
  - and retained testicle, 43
- Syphilis and atrophy of testis, 445
  - and circumcision, 635
  - and elephantiasis, 578
  - of epididymis, 311
  - and epithelioma of penis, 718
  - hereditary, 312
  - and induration of penis, 681
  - testis (*vide* Orchitis), 304

- TAPPING a hydrocele, 134
  - and gangrene of scrotum, 137, 546
- Tar and cancer, 561
- Teratomata, 429
- Testis, abnormal position in scrotum, 93
  - abnormalities, congenital, 21
  - abscess of, 261, 263, 264
  - absence of, 23, 24
  - alone present, 25
  - development of, 1
    - abnormalities of, 21
  - ectopia (*vide* Ectopia), 29
  - encysted hæmatocele, 240
  - fusion of, 15
  - gangrene of, 54, 55, 56, 265
  - growths of (*q.v.*), 384
  - hernia of (*q.v.*), 443
  - and hæmatocele, 225, 226
  - and hydrocele, 114, 115, 133
  - hypertrophy of, 443
  - inflammation of (*vide* Orchitis and Epididymis Orchitis), 248
  - inversion of, 93
    - causes of, 94
  - irritable (*q.v.*), 452
  - malignant, 384
    - (*vide* Malignant Diseases)
    - (*vide* Carcinoma, &c.)
- Testicle, atrophy (*vide* Atrophy), 444
  - misplaced,
    - atrophy of, 62
    - epididymitis, 61
    - gangrene, 54, 55
    - hæmatocele, 64
    - and hernia, 49, 54, 72
      - strangulated, 80
    - and hydrocele, 62
      - encysted, 73
    - inflammation, 49
    - malignant, 65
    - new growths, 49

Testicle, misplaced, orchitis, 61
peritonitis, 62
transplantation of, 83
transit of, 34
tubercular, 65
mobility of fetal, 2
in later life, 18
new growths, 384
neuralgia of, 452
nutrition of, 443
puncture in hydrocele, 136
in epididymitis, 271
retained (*vide* Retained)
reversion, 95
sloughing of, 54, 55, 56, 265
supernumerary, 21
syphilitic (*vide* Orchitis), 334
transit of, 1, 10, 11
causes of, 11
errors of, 14
incomplete, 29
reasons for, 18
transplantation, 83
operation, 84
with hernia, 86
tubercular, 321
acute, 344
diagnosis, 347, 356
symptoms, 345
urethral discharge, 346
chronic, 321
bacilli, 323
bilateral, 358
caseation, 342
castration, 366, 370, 372
cautery, 366
coitus, 323
commencement, 322
complications, 361
course, 356
diagnosis, 353
from malignant, 402, 403
epididymis, 331
heredity, 327
hydrocele, 338, 339
infection, 330
injury, 329
and kidneys, 341
microscopical, 341
morbid anatomy, 331, 335
and prostate, 340
pulmonary lesion, 371
scraping, 364
suppuration, 350
symptoms, 348
treatment, 363
tunica vaginalis, 337
vas deferens, 339
venereal excitement, 331
vesiculæ seminales, 340
tubercular, in infants, 373
bacilli, 374
causes, 374
peritonitis, 374
Theories of hydrocele, 102
malignant disease, 396
Thrombosis of iliac veins, 674
Thrombosis and varicocele, 524, 533
of venous spaces of penis, 680
Tincture of iodine for injection, 142
Tonsillitis and orchitis, 297
Torsion of cord and gangrene, 55, 56
diagnosis from hernia, 57
of penis, 612
Traction in paraphimosis, 642
Trades and cancer, 560, 561
Transit of testis (*vide* Testis), 11
errors in, 14
Translucency of abscess, 118
of hernia, 118
of hydrocele, 117
Transplantation of testis, 84
Truss and atrophy of testis, 446
hydrocele, 102
in congenital, 168
retained testis, 43, 84, 88
and varicocele, 537
Wood's, 75
Tubercle bacillus, entrance of, 323
and circumcision, 637
of penis, 690
(*vide* Testis, &c.)
Tubercular testis (*vide* Testis)
Tunica albuginea, bone in, 683
and hydrocele, 109, 112
Tunica vaginalis in carcinoma, 388
in enchondroma, 400
fibroma of, 434
and hydrocele, 109, 112
lipoma of, 433
and radical cure of, 159
sarcoma of, 435
and serous membranes, 97
suppuration in, 260
in tubercular testis, 337
Typhoid gangrene of penis, 673
orchitis, 283
Typhus and gangrene of penis, 672

ULCER, epitheliomatous, 710
Uræmia and phimosis, 623
Ureter in anorchism, 28
Urethra, stricture of, and masturbation, 485
epididymitis, 250, 251
in epithelioma of penis, 713, 721, 724
Urethritis and induration of penis, 681
Urinary cyst of scrotum, 570
treatment, 572

VAGINALITIS (*vide* Hydrocele), 97, 215
Valves in varicocele, 522
Varicocele, 520
and atrophy of testis, 447, 525, 535
causes, 527, 529
complications, 533
congenital, 528
diagnosis, 531
extravasation of blood, 533
fœtal veins in, 529
involution, 536
meso-phlebitis, 530
and neuralgia, 453, 454
operation for, 537, 541
in recruits, 529
recurrence, 543

Varicocele, ring for,
  rupture, 533
  side affected, 520, 530, 531
  symptoms, 531, 532, 533
  testis in, 447, 525, 531
  thrombosis, 524, 533
  treatment, 536
  truss for, 537
  valves, 522
  varieties of, 534
  veins in, 521, 523
Varicose veins of penis, 692
  of scrotum, 565
Varix of dorsal vein and impotence, 483
Vas aberrans, 15, 16
  and cysts, 199
Vas deferens, absence of, 24, 26
  abscess along, 261
    of, 499
  and neuralgic testis, 453
  in tubercle, 339
Vegetations in epithelioma penis, 709
Venereal disease and balanitis, 652
  and epithelioma, 717
Vesiculæ seminales, abscess of, 596
  absence of, 25, 26
  anomalies, 24, 27, 591
  atrophy, 592
  carcinoma, 608
  concretions, 603
  cysts, 600
    and Müller's duct, 601
  dilatation, 600
  seminales, diseases of, 591
  in epididymitis, 259
Vesiculæ gonorrhœa, 593
  hydrocele of, 602
  inflammation of, 593
    causes, 593
    sequelæ, 596
    symptoms, 595
    treatment, 598, 599
  and neuralgia, 453
  and peritonitis, 596
  and pyæmia, 598
  removal of, 606
  and retained testis, 42
  sarcoma of, 608
  suppuration of, 594, 597
  tubercle of, 605
  in tubercular testis, 342
Vessels in retained testis, 42
Visceral metastasis, in malignant disease of testis, 401
  in enchondroma, 416
  in epithelioma of the penis, 716
Vomiting, importance of, in diagnosis of inflamed testis, 81, 82
  in malignant disease of testis, 389
  in enchondroma, 416
  in cystic sarcomata, 429
  in epithelioma of penis, 716

WARTS, 704
  and malignancy, 553, 705, 708, 722
Wolffian bodies, 14
  and cystic disease, 427
  duct, 15
Wood's truss, 75

INDEX OF NAMES.

Adams (J. E.), case of perineal ectopia, 40, 91
Albinus, traumatic aneurism of penis, 692
Allin, hæmatocele, gas in cavity of, 225
Anderson (Nottingham), case of myxosarcoma of cord, 517
Annandale, perineal ectopia, successful operation for, 91
Arnott, sarcoma of retained testis, 68
Arthaud, structure of misplaced testis, 46; small cysts of epididymis, 188; classification of growths of testis, 385
Augagneur, gonorrhœal epididymitis, 249

Babès, tubercle and coitus, 326
Bacon, castration in onanism, 477
Ballance, dressing for circumcision, 63
Bancroft, filaria, 577; in scrotal elephantiasis, 577; in lymph scrotum, 587
Bangs (New York), orchitis simulating tubercle of testis, 354
Banks (W. **Mitchell**), origin of small cysts of epididymis, 187
Barbier, tubercle and coitus, 325
Barèty, hydrocele, radical cure of, by tapping, 139
Barling, tubercle of testis, ultimately fatal, 360
Barwell, relation of masturbation and hip disease, 625
Bastien, vas deferens in absence of testis, 25, 27
Battey (Georgia), castration in onanism, 476
Battle, sarcoma of penis, 740
Bauchet, cystic growth of scrotum, 569
Bazy, hydrocele, secondary to ascites, 165; bilocular hydrocele, 172, 175
Beamish, suppuration of testis after gonorrhœa, 262
Bean, lymphatics of penis, 699
Beauvais, diabetic balanites, 658
Beck (M.), translucency of hernia in children, 118; sarcoma of penis, 738
Beckmann, case of concretion in ejaculatory duct, 604
Beigel, ectopic testes fertile, 45; concretions of vesiculæ seminales, 604
Bell (Boston), castration in onanism, 476
Bell (J.), paraffin and scrotal epithelioma, 561
Bell (**Royes**), tubercular deposit in vas deferens, 339
Bennett, W. H., tubercle of testis and vertebral caries, 361; varicocele, 520, 524, 525, 528, 533; operation, 540, 542
Bérard, mumps and orchitis, 282; tubercle of prostate, 341
Béraud, hydrocele "en bissac," 112; intratesticular hæmatocele, 242; orchitis and smallpox, 287, 288
Bergmann, excision of sac in hydrocele, 155
Berkeley Hill, acquired phimosis, 640; herpes, 661, 664; gummata of penis, 681
Billroth, iodine injection in hydrocele, 141; excision of nodules in epididymitis, 277; suppuration in chronic orchitis, 303
Binet, persistent infantile genitals, 619
Birch-Hirschfeld, carcinoma, 385; lymphadenoma, 408
Birkett, case of prolonged priapism, 696
Blasius, supposed triple testis, 21
Blondin, entire absence of seminal apparatus, 25
Bluff, mumps and orchitis, 282
Bokai, diphtheritic balanitis, 654
Bond (Leicester), acute hydrocele and pericarditis, 99
Bonnafont, collodion in acute epididymitis, 273
Booth, case of prolonged priapism, 696
Bouchut, orchitis in fevers, 284
Bouisson, rheumatic orchitis, 295
Bowie, pulsatilla in acute inflammation of Cowper's glands, 274
Bowman (Sir W.), hæmatocele of cord, 509
Boyer, mumps and retained testis, 62; inversion of testis, 95; typhoid and gangrene of penis, 673; gangrene of penis after use of cantharides, 674; intermittent fever and gangrene of penis, 673
Bramann, gubernaculum, 6; processus funiculo-vaginalis, 9
Breus, case of myxoma of testis, 419
Broca, cysts of epididymis, 205; lipoma of cord, 514; question of natural cure of tubercle of vesiculæ seminales, 605
Brodie (Sir B.), encysted hydrocele, 204; loose bodies in tunica vaginalis, 214; hæmatocele, 216, 226; gonorrhœal epididymitis, a metastasis, 251
Brouard, fibroma of cord, 516
Brown-Séquard, epididymo-orchitis, explanation of, 252
Bruce, epithelioma, question of infection from wife, 721
Bruns, case of myxoma of testis, 418
Brunton, pulsatilla in epididymitis, 275
Bryant (T.), torsion of cord, 57; origin of encysted hydrocele, 196; intra-testicular hæmatocele, 241; case of hypospadias and orchitis, 302; myxo-lipoma of cord, 515

Brugnone, absence of epididymis, 26
Brown, dilatation of prepuce, 646
Browne (Buckston), carbolic acid injection in hydrocele, 149
Bull (New York), carbolic acid injection in hydrocele, 146
Bumstead, congenital syphilis of testis, 314
Butlin, carcinoma of testis, 389; sarcoma, 397; chimney-sweep's cancer, 555, 559

Cabrol, case of double anorchism, 28; gangrene of penis after cantharides, 674
Capitan, organisms in mumps, 282
Callaway, case of obstinate priapism, 697
Cameron, cysts of epididymis, 204
Campbell de Morgan, chondro-sarcoma, 413
Carpenter, hereditary syphilis of testis, 313
Carter, lymph-scrotum, 587
Caster, suppuration in a cystic Tyson's gland, 702
Catelan, mumps and epididymitis, 62
Cauchois, gliomatous sarcoma of testis, 395
Cervelle, orchitis and fevers, 284
Chambers (Chicago), pulsatilla in orchitis 273
Chassaignac, loose body in tunica vaginalis, 214
Charvot, orchitis and ague, 289
Chauternesse, orchitis and microbes, 286
Chauveau, microbes and injury, 330
Chavin, organisms in mumps, 282
Chedevergne, orchitis and fevers, 284
Chiari, orchitis and small-pox, 287
Cintrac, sudden ascent of testis, 42
Cleland, explanation of extra-abdominal position of testis, 19
Cline, paraplegia secondary to malignant testis, 389
Cloquet, congenital hydrocele and peritonitis, 168; hæmorrhage after castration, 440
Cock, suppuration of vesiculæ seminales, 597; castration for "cancer," no return for six years, 407
Cohnheim, theory of malignant disease, 385
Collier, absence of penis, 610
Cooper, Sir A., sloughing after tapping of hydrocele, 137; case of rupture of tunica vaginalis, 230; elephantiasis of penis, 700
Coote (Holmes), metastatic carcinoma of penis, 744
Cornet, tubercle bacillus, experimental inoculation of, 325
Craven, sarcoma of tunica vaginalis, 436; medullary cancer of scrotum, 552
Crevissier (d'Hurbache), orchitis and mumps, 282
Crocker, "Paget's disease" of scrotum, 564
Croft, preputial calculi, 649
Crompton, cystic disease of scrotum, 568
Cruveilhier, fibroma of testis, 417; anatomy of spermatic veins, 521; induration of erectile tissue of penis, 678; variety of sebaceous cysts of prepuce, 702
Cullerier, iodine and atrophy of testis, 448
Curling, gubernaculum, 7; abnormalities of testis, 26; misplaced testis, 36, 38, 39, 45, 47; case of peritonitis from retained testis, 62; hydrocele of retained testis, 64; inversion of testis, 94; multilocular hydrocele, 112; cysts of epididymis, 192, 196, 201; encysted hydrocele, 202; hydrocele of cord, 208, 501, 503; castration in malignant disease, 400, 407; cystic disease, 426; enchondroma, 412; sarcoma of tunica vaginalis, 436; atrophy of testis, 445; myxo-lipoma of cord, 515; varicocele, 520, 523, 525, 537; chimney-sweeps' cancer, 558, melanotic growth of scrotum, 563
Cusack, soot-wart on hand of chimney-sweeps, 558
Czerny, case of removal of ectopic testis, 71

Damsch, inoculation of tubercle as a means of diagnosis, 353
Dauvé, encysted hydrocele, 204, enchondroma of testis, 409
Davies-Colley, torsion of cord, 58; circumcision 631, 632
Davies (Cairo), chylous hydrocele, 178
Day, dilatation of lymphatics of penis, 699
Debout D'Estrees, gouty orchitis, 293
Debrade, encysted hydrocele of cord, 503
Delbet, lipoma of cord, 514
Delfau, tubercular prostates, size, 341
Delorme, question of epididymitis from strain, 299
Delpech, extirpation of penis, 734
Demarquay, decortication of hematocele, 238; apparent absence of penis, 610; webbed penis, 613; preputial calculi, 646; lymphangitis of penis, 667; penitis, 670; gangrene, 672; varicose veins of penis, 692; extension of epithelioma into penis, 712
Denis (New York), cure of hydrocele by tapping, 139
Denonvillier, decortication of hæmatocele, 238
Deschamps, tubercular testis in infants, 373, 375
Desprès, cancer of retained testis, 69
Dhomont, rheumatic orchitis, 296
Diday, herpes, 661
Dobson, hæmorrhage and suppuration after tapping a hydrocele, 137
Dogny, orchitis and atrophy, 280
Dolbeau, cysts of epididymis, 195
Doyen, herpes progenitalis, 661
Doyon, tuberculosis of testes and urethra, 351
Dreschfeld, tubercular testis in infants, 327
Dron, syphilitic epididymitis, 312
Dukes (Rugby), orchitis of mumps, 279
Dummreicher, infantile type of penis, 619
Duplay, bilocular hydrocele, 172; epididymitis from strain, 299; acute tuberculosis of testis and epididymis, 344, 345; encysted hydrocele of cord, 503
Dupuytren, diagnosis of hydrocele, 123; multiple hydroceles, 124; origin of bilocular hydrocele, 171

Earle, chimney-sweep's cancer, 558, 561
Eisenberg, circumcision, tubercle transmitted by, 638
Eloy, orchitis in fevers, 284; orchitis in typhoid, 285
Engel, congenital hydrocele, 162; encysted hydrocele of cord, 503
Englisch, varieties of retained testis, 34; epididymitis from strain, 301; cysts of vesiculæ seminales, 601
Escalier, varicocele, suppuration in, 533
Eve, cystic diseases of testis, 420, 423, 426, 427; circumcision, tubercle transmitted by, 638

Fano, sebaceous cysts of prepuce, 702
Fayrer (Sir J.), excision of lymph-scrotum, 588
Fenwick, sarcoma of crus penis, 740
Fergusson (Sir W.), hæmatocele following acupuncture of hydrocele, 227
Fergusson (Dr.), case of traumatic gangrene of penis, 674
Fisher (Boston), absence of testes, 27
Fischer, tubercle of retained testis, 65
Fisher (G.), melanotic sarcoma of penis, 742
Flanagan, case of misplaced testis, 34
Fleming, cystic disease of scrotum, 570
Fleury, double hydrocele and sterility, 134; phimosis and masturbation, 624
Follin, descent of vas deferens below a retained testis, 31; efficacy of ectopic testis, 45; torsion of penis, 612
Foster, preputial calculi, 647
Foster (N. S.), rupture of hydrocele, 131
Fournier, gonorrhœal epididymitis, 249; syphilitic, 312; syphilitic orchitis, 314; gangrène foudroyante, 675; gummata of penis, 689
Fowler (W.), crural ectopia, 37
Freidberg, phimosis and hernia, 623
Friedrich, diabetic balanitis, 657; dilatation of lymphatics of penis, 699
Friese, absence of entire seminal apparatus, 27
Fürbringer, sterility, husband often at fault, 490

Gaupail, suppurating orchitis and injury, 303
Gauzot, varicocele, 529, 531
Garrod, orchitis, gouty, 293
Gascoyen, sexual hypochondriasis, 469
Gaussail, pathological anatomy of epididymitis, 253, 262
Gautier, gangrene of penis, 673
Gay, torsion of penis, 612; gangrene of penis, 673
Gendrin, orchitis, gouty, 295
Gerster (New York), tunica vaginalis (tubercle), 338; fibro-sarcoma of scrotum, 573
Gherini, peritonitis from removal of retained testis, 63
Giraldès, hæmatocele, 242; tubercular testis in infants, 327
Girard, orchitis and malaria, 289
Godard, absence and abnormalities of epididymitis and testis, &c., 26, 27, 28, 33, 36, 45; hernia and retained testis, 74
Godlee, retained testis, 42
Goodhart, syphilitic orchitis usually bilateral, 316
Goodwin, castration for masturbation, 476
Gorré, double penis, 616
Goschler, absence of penis, 609
Gosselin, retention of testis, 33; encysted hydrocele of epididymis, 186, 191; cysts of epididymis, 195, 201, 206; hæmatocele, 216, 217, 221; obliteration of epididymis, 267; orchitis and smallpox, 287; orchitis and congenital syphilis, 312; inflammation of vas aberrans, 500; encysted hydrocele and hernia, 503
Gould (**Pearce**), causation of fatty hydrocele, 181; encysted hydrocele, 205; varicocele, 529; horn of penis, 703; extirpation of penis, 734
Gowers, on continence, 463
Gray, bilocular hæmatocele, 245
Gross, varieties of impotence, 481, 485, 486
Grüber, absence of testis, 23; inguinal retention of testis, 34, 39
Gueilliot, detection of enlarged vesiculæ seminales, 595; tubercle of vesiculæ seminales, 605
Guelliot, epididymitis from strain, 299
Guerlain, torsion of penis, 612
Guilland, rheumatic orchitis, 296
Guincourt, crural ectopia, 38
Guyot, gouty orchitis, 294

Hamilton, orchitis and typhoid, 286
Hanley, diffuse hæmatocele of cord, 508
Hanot, orchitis and fevers, 284
Hardy, epididymitis, 253
Hargis, case of priapism, 696
Harrison, orchitis and typhoid, 286
Harris, orchitis and influenza, 289
Hart (E.), case of double penis, 482, 615
Haward (J. **Warrington**), fibroma of testis, 417
Hawkins (**Cæsar**), case of castration for soft growth, no recurrence for twelve years, 407; case of epithelioma scroti, 558
Heath (C.), fibroma of tunica vaginalis, 434
Heinemann (New York), cystic degeneration of vesiculæ seminales, 600
Helferich, carbolic acid injection of hydrocele, 146
Henoch, orchitis and scarlet fever, 288
Heurteloup, orchitis and scarlet fever, 288
Hewitt (Sir P.), chronic thrombosis and induration of corpora cavernosa, 680
Hilton, case of "fibro-cellular" growth of scrotum, 573; peculiar nervous symptoms explained by masturbation, 624; unilateral pain on penis, 686
Hird, case of priapism, 696
Hockenegg, hydrocele-cysts of epididymis, 191
Holmes (T.), fibroma of tunica vaginalis, 434; congenital venous tumour of scrotum, 565; melanotic sarcoma of penis, 742
Holthouse, retained testis and hydrocele, 64
Home (Sir E.), risk of presence of hernia in castration, 437
Howse, treatment of the frænum in circumcision, 630; case of primary epithelioma of the urethra, 709
Hulke, retained testis and hernia, 43

Humphry (Sir G.), translucent abscess, 118; hydrocele and cysts, 125; bilocular hydrocele, 174; foreign body in hydrocele, 214; epididymitis, 251

Hunter, gubernaculum, 7; cremaster, 10

Hutchinson (J.), case of encysted hydrocele, 202; abscesses along vas deferens after lithotrity, 252; orchitis syphilitic, 310, 314, 316, 319; supposed harmful effects of iodides on the testicles, 448; diffuse lipoma of pubic region, 575; elephantiasis scroti, 578, 579; relation of phimosis to venereal disease, 627; conveyance of syphilis by circumcision, 635; balanitis perstans, 656; relation of herpes to syphilis, 662; lupus of penis, 665; case of spontaneous gangrene of penis, 675; case of elephantiasis of penis, 700; diagnosis of epithelioma of penis, 723; precancerous stage in epithelioma, 725; primary sarcoma of penis, 738

Hutchinson (J., jun.), case of encysted hydrocele of cord, 504; origin of lipomata of cord, 513

Hussey, hydrocele, rupture of, 132; setons in, 161

Hutinel, tuberculosis of the testicle in infants, 373, 375

Jaccoud, orchitis after typhoid fever, 285

Jarjavay, cystic disease of retained testis, 66

Joal, inflammation of the testicle in acute tonsillitis, 297

Johnson, induration of corpora cavernosa after gonorrhœa, 681

Jonin, tubercular endometritis from local infection, 325

Juillard, method of radical cure of hydrocele by excision of the sac, 155

Jullien, frequency of seminal emissions in acute epididymitis, 259; tubercular testis in infants, 327; explanation of frequency of tubercular testis in left side, 374; herpes progenitalis, 661; gummata of penis, 689

Kaposi, diabetic balanitis, 638

Kaufmann, congenital fistula of penis, 617; formation of preputial calculi, 647; herpes progenitalis, 674; application of iodine in gangrene of the penis, 671; rarity of gummata of the penis, 688; elephantiasis of the penis, 708; commencement of epithelioma of penis, 708; invasion of glands in epithelioma of penis, 709; sarcoma of penis, 741; metastatic carcinoma of penis, 744, 745

Keen (Philadelphia), gangrene of scrotum after fever, 547, 673

Kelly, orchitis in influenza, 289

Kempe, phimosis in congenital hernia, 623

Kendall (Sydney), chylous hydrocele, 179

Kerr, chondroma and osteoma of scrotum, 574

Ketli, priapism of leukæmia, 694

Keyes (and Van Buren), case of double penis, 615

Kirby, chronic induration of corpora cavernosa, 679

Klebs, pathology of encysted hydrocele, 187; nature of fatty hydrocele, 182; atrophy of testicle from injury to dorsal cord, 447

Klein, remnants of Wolffian body in testis, 428

Kocher, gubernaculum, 6, 8; congenital hydrocele, 163, 166; bilocular hydrocele, 173; cysts of the epididymis, 186, 187, 194; condition of testicle in old hæmatoceles, 226; nature of orchitis in mumps, 283; diagnosis between sarcoma testis and hæmatocele, 404; sebaceous cysts of scrotum, 566; tubercular disease of vesiculæ seminales, 605; inflammation of vesiculæ seminales, 545; mixed carcinoma of testis, 391; date of glandular enlargement in malignant disease of testis, 407; lymphadenoma testis, 408; visceral metastases in epithelioma penis, 716; nature of cystic disease of testis, 427

Koehler, gangrene of penis from thrombosis of pelvic veins, 674

Kohn, inflammation of the cord, 260

Kotschau, question of infection with tuberculosis in coitus, 324

Kraske (P.), tuberculosis of penis, 690

Kremme, priapism of leukæmia, 664

Kretzchmar, entire absence of seminal apparatus, 27

Kronlein, epithelioma of penis started by contusion, 720

Krummer, hydrocele of cord, conversion into hæmatocele, 505

Lallemant, rapid gangrene of scrotum, 547

Lallemand, on so-called spermatorrhœa, 467

Lammert, case of hydrocele "en bissac," 172

Landouzy, causation of left-sided varicocele, 531

Langenbeck, encysted hydrocele of cord, 504

Langhans, sarcoma of testis, starting-point, 392; carcinoma of testes, origin, 386

Langton, case of torsion of the cord, 60; hydrocele of sac of femoral hernia, 208

Larquier (and Sadrain), orchitis in typhoid, 284

Lancereaux, gummata in cord, 309

Laurens, mumps, orchitis, and atrophy, 280

Lebert, origin of dermoid cysts, 431

Lehmann, tuberculosis transmitted by circumcision, 637

Le Dentu, side affected in misplaced testicle, 30; malarial orchitis, 290, 291

Lee (H.), fibroma of testis, 417; danger of sepsis after operations on varicocele, 542

Legendre, imperfect development of vas deferens, 25

Lenhossék, formation of bone in penis, 683

Leloir, induration of corpora cavernosa, 678

Lemarque, sarcoma of cord, 518

Lenoir, causation of left-sided varicocele, 531

Levis, injection of hydroceles with carbolic acid, 148

Lereboullet, mumps, orchitis, and atrophy, 280; development of breasts after atrophy of testicles, 451

Lesauvages, myxoma of cord, 517; huge fibrous growth of scrotum, 573
Levestre, orchitis after typhoid fever, 285
Lewin, spermatazoa in small cysts of epididymis, 187; preputial calculi, 646
Liégois, chronic bilateral epididymitis and sterility, 277
Lindmann, tuberculosis transmitted by circumcision, 637
Lister (Sir J.), encysted hydrocele, 204; boracic acid dressing, 729
Liston, origin of cysts of epididymis, 192
Lippman, scrotal calculi, 589
Lloyd, preputial calculi, 647
Lloyd (Jordan), inflammatory affections of the vesiculæ seminales, 593, 594, 595
Lloyd (E. A.), origin of cysts of epididymis, 192
Lockwood, development and transit of testicle, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 16, 40
Looten, tuberculosis of penis, 691
Louis, visceral metastases after epithelioma of penis, 716
Lucas (Championnière), chronic form of tuberculosis of testis, 351
Lucas (R. Clement), a form of late rickets due to masturbation, 624
Ludlow, case of abscess in testicle, 262; case of supposed scirrhus of scrotum, 552
Luëcke, gummata of penis, sequelæ of, 679
Luschka, cysts arising in vas aberrans, 16; congenital fistula of penis, 617
Lydston (Chicago), pulsatilla in orchitis, 274
Lynch, nature of orchitis in mumps, 282

Makuna, association of hæmatocele with malignant disease, 233
McCarthy, scrotal, or extra-vaginal hæmatocele, 549
Mackie, case of priapism, 699
MacClellan, bone in penis, 683
McLeod, operative treatment of scrotal elephantiasis, 581
Malassez (and Terrillon), pathology of epididymis orchitis, 253
Malassez, origin of cystic disease of testis, 390, 426
Malgaigne, origin of bilocular hydrocele, 171; traumatic aneurism of dorsal artery of penis, 692
Manby, orchitis and typhoid, 286
Mansell-Moullin (C.), sarcoma of cord, 518
Manson, pathology of scrotal elephantiasis, 577; of lymph-scrotum, 585
Marjolin, fibroma of testicle, 417
Marlier, testicle descending late and becoming malignant, 71
Marshall, frequency of misplaced testis, 30
Martel, pulsatilla and epididymitis, 275
Martin (Sir R.), injection of hydrocele with iodine, 140
Martin, W. M. (Mobile), case of chylous hydrocele, 177
Martin, E. (Philadelphia), epididymo-orchitis after strain, 300
Mason (Philadelphia), sarcoma of cord, 518
Mauriac, results of paraphimosis, 642; neuralgic herpes, 660; causation of chronic induration of corpus cavernosa, 680
Maurer, angio-sarcoma of penis, 741
Maurel, orchitis and malaria, 289
Meade, castration for malignant disease, without recurrence, 407
Menzel, origin of cysts of epididymis, 195
Méricamp, malignant disease of vesiculæ seminales, 608
Meyer, transmission of tuberculosis by circumcision, 638
Miller, flap-amputation of penis, 746
Mitchell-Henry, suppuration of vesiculæ seminales and peritonitis, 597
Molinas, malaria and epididymo-orchitis, 289
Mollière, acute hydrocele of cord, 500
Monk, hydrocele inflamed after slight injury; 133
Monks, case of congenital tubercular testis, 327
Monod, injection of hydrocele with carbolic acid, 147; structure of small cysts of epididymis, 187
Monod (and Arthaud), structure of misplaced testes, 30
Monod (and Terrillon), congenital abnormalities of testicle and its annexa, 21, 23, 26, 27, 29; gonorrhœal inflammation of misplaced testis, 61; tubercular degeneration of misplaced testis, 65; castration for misplaced testis, 69; crura-scrotal retention, 74; diagnosis of congenital hydrocele, 166; fibrous bodies in tunica vaginalis, 213; origin of hæmatocele, 216; walls of hæmatocele, 222; rare cause of epididymitis, 251; pathology of epididymitis, 254, 255; suppuration in tunica vaginalis in epididymitis, 269; atrophy of testis in syphilis, 310, 319; hernia of tubercular testis, 377; classification of new growths of testis, 385; cystic carcinoma of testis, 390; early stage of malignant disease of testis, 399; lymphadenoma, 408; origin of cartilage in testis, 412; myxoma of testis, 418: fibroma of tunica vaginalis, 434; thrombosis in varicocele, 533
Monro, case of hydrocele of a hernial sac, 210
Montanier, acute hydrocele in epididymo-orchitis, 270
Morgagni, case of spurious third testicle, 22
Moxon, sarcoma recurrent in castration scar, 552; leprosy affecting prepuce, 666
Muskett, hydatid cyst in scrotum, 570
Murphy, apparent absence of penis, 610

Nélaton, weight of scrotal swellings, 120
Nepven, scirrhus of testicle, 390
Neumann, myxoma of testicle, 419; metastatic carcinoma of penis, 744
Nicaise, misplaced testis complicated with hernia, 72
Nicoladoni, gangrene of testis from torsion of cord, 56
Norburn, gangrenous epididymo-orchitis, 265
North, orchitis from congenital syphilis, 313

Obedenaro, inflammation of vas deferens in congenital syphilis, 314

Ogston, tar and paraffin as causes of epithelioma, 561
Ollivier, orchitis after typhoid fever, 284
Oltramare, rapid gangrene of penis, 675
Osborn, perinæal ectopia, 35
Otis, inflammation of vas deferens from irritation of the urethra, 258
Ozanne, gummata of penis, 688

Page (H. W.), case of torsion of the cord, 59; urinary cyst of scrotum, 521
Page (Carlisle), case of hypertrophy of testicle, 444
Paget (Sir J.), mal-development of vas deferens, 25; pathology of cysts of epididymis, 201; gouty orchitis, 292; enchondroma of testicle with secondary deposits, 412; atrophy of testis in varicocele, 525; virility and varicocele, 535; chimney-sweep's cancer, 556; scrotal fibromata, 572; scrotal lipomata, 575; chronic induration of penis, 679; acute gouty affection of penis, 684
Pallington, mal-development of vas deferens, 25
Panas, causation of hydrocele, 103
Park (Buffalo), lipoma of tunica vaginalis, 433
Parise, mal-development of the vas deferens, 26
Partridge, transplantation of misplaced testis, 91; gangrene of penis in typhus fever, 672
Paton, hydrocele combined with hæmatocele, 228
Péchaud, gouty orchitis, 294
Pellier, epididymo-orchitis from strain, 299
Penny, rheumatic orchitis, 296
Pepper, myxo-chondro-sarcoma of spermatic cord, 517
Périer, valves in spermatic veins, 522
Petit, parenchymatous hæmatocele, origin, 242; congenital division of prepuce, 644
Peyrot, frequency of misplaced testis, 30
Phillips (Bedford), case of renal tuberculosis, 346
Phocas, congenital hydrocele and ascites, 165
Pilliet, condition of testis in old hæmatoceles, 226
Podrazki, sarcoma of penis, 741
Poisson, fibroma of spermatic cord, 516
Polaillon, abscess in testis after gonorrhœa, 262; hæmatocele supervening on hydrocele of cord, 506
Poland (A.), efficacy of retained testis, 48
Poland (J.), case of congenital hydrocele, 166
Popow, peno-pubic ectopia, 38
Pott, retained testis simulating strangulated hernia, 54; translucency as a symptom of hydrocele, 118; diffuse hydrocele of cord, 502; chronic œdema of scrotum, 545
Pribram, congenital fistula of penis, 617
Pruner, elephantiasis of penis in negroes, 700
Puche, long prepuce and venereal disease, 627
Pye-Smith (P. H.), herpes progenitalis, 659

Quekett, pathology of encysted hydrocele, 208
Quelliot, transplantation of misplaced testis, 40
Quinquaud, orchitis and small-pox, 287

Ralfe, cystic disease of vesiculæ seminales, 601
Recklinghausen, sarcoma of testis, starting-point, 392
Réclus, causation of hydrocele, 104; syphilitic orchitis, 315; prognosis in, 319; question of tubercular infection in coitus, 327; tubercular epididymitis, 333; hydrocele in tubercular testis, 337; acute tubercular disease of testis, 344; usual onset of caseation, 350; prostate in tubercular testis, 352; development of hernia, in tubercular testis, 378
Reliquet, concretions in vesiculæ seminales, 603
Rennes, frequency of ectopia testis, 30
Ressynier, nature of orchitis in mumps, 282
Réverdin, ruptured hydrocele, 131; sarcoma of tunica vaginalis, 435
Révolat, absence of external genitals, 610
Richards, frequency of congenital hydrocele, 163
Richet, inguinal variety of misplaced testis, 39; valves in spermatic veins, 522; diabetic balano-posthitis, 658
Ricord, perinæal ectopia simulating abscess 36, 61; question of suppuration of syphilitic testis, 311; exciting cause of syphilitic testis, 311; tubercular disease of the genital passages, 333
Rilliet, nature of orchitis in mumps, 281
Rindfleisch, carcinoma of testis, 389; malignant disease of genitals from irritation, 396
Ripault, mal-development of the vas deferens, 25
Rivington, hernia, complicating encysted hydrocele of cord, 160; patency of funicular process in castration, 437; degenerated nævus of scrotum, 566
Rizet, nature of orchitis in mumps, 282
Rochard, bilocular hæmatocele, 247
Rokitansky, myoma of testis, 419
Romano, myxoma of testis, 419
Rouge, melanotic growth of scrotum, 563
Rose, obstinate priapism treated by incision, 697
Rosenbach, pathology of cysts of epididymis, 193
Roser, patency of processus funiculo-vaginalis, 162
Rostan, gangrene of prepuce after small-pox, 673; bone in penis, 683
Roth, absence of prepuce, 644
Rockwell, case of acute tubercular disease of testis, 347
Roubaud, hydrocele and sterility, 134
Roux, epididymo-orchitis from strain, 299
Roydes-Barres, inguinal ectopia, 39
Rydigier, melanotic sarcoma of testis, 395

Sabourin, orchitis in typhoid fever, 284
Sadrain, orchitis in typhoid fever, 284
Saint-Ange, abscess in cord, and epididymis, 262

Salleron, puncture of the testicle, 271
Saltzmann, entrance of bacillus in tubercular epididymitis, 323
Salzer (Worms), priapism and leukæmia, 693
Santesson, rapid malignant growth of testicle, 398
Sappey, pathology of cysts of epididymis, 195
Satre, urinary cysts of scrotum, 570
Sayre, phimosis and hip-disease, 625
Scarpa, hydrocele of hernial sac, 209
Schaffner (Heidelberg), epithelioma scroti and dirt, 558
Schepelern, pathological anatomy of epididymo-orchitis, 253
Schkott (Moscow), scrotal calculi, 590
Schmidt, bilocular hydrocele, 173
Schoull, tubercular testis following injury, 330
Schuchardt, pre-cancerous plaques of prepuce, 720
Senn, multilocular hydrocele, 112; question of infection with tuberculosis in scrotum, 324; complications of tubercular testis, 361
Shattock, causation of fatty hydrocele, 182; cystic disease of kidney and fœtal veins, 427
Sharkey, case of sarcoma of penis, 740
Shield, suppurative affections of testis and epididymis, 263, 264, 286, 288, 303
Simmonds (Hamburg), tunica vaginalis in tubercular testis, 358
Simon, hydrocele in tubercular testes, 338; diabetic balanitis, 657
Sistach, muscular contraction as a cause of varicocele, 531
Smith (N. R.), "hydrocele" of vesiculæ seminales, 602
Smith (H.), puncture of the testicle, 271
Smith (Dr.), pulsatilla in epididymo-orchitis, 275
Socin, enormous malignant growth of testicle, 399; encysted hydrocele of cord, 504
Spence, sarcoma of cord, 519
Spencer, relation of varicocele to fœtal veins, 529; cells in chimney-sweep's cancer, 555
Stanley, abscess of testis after lithotrity, 263
Steinthal, multilocular hydrocele, 126
Steudner, pathology of cysts of epididymis, 193
St. Hilaire, dermoid cysts of testicle, origin, 431; case of double penis, 616
Strümpell, tuberculosis of genito-urinary tract, 324
Sutton (Bland), transit of testicle, 13, 18; cystic disease of the testicle, 427; cystic disease of kidney and testicle, 427
Svalin, case of spontaneous hæmatocele, 26
Syme, bilocular hydrocele, 175; operation for hernia testis, 385
Szymanowski, over-action of cremaster in retention of testis, 41; castration for malignant retained testis, 69

Targett, myxo-lipoma of cord, 515
Taylor (R. W.), cord in congenital syphilis, 314; sebaceous cyst of scrotum, 567
Terrillon, experimental epididymitis, 252; pathology, 253
Thiersch, extirpation of penis, 734
Thiriar, carcinoma of retained testis, 71
Tillmans, bilocular hydrocele, 172
Trélat (and Peyrot), frequency of ectopia testis, 30; myxoma of testis, 418; dilatation of lymphatics of penis, 699
Tripe, case of obstinate priapism, 696
Troisfontaines, case of unexplained gangrene of penis, 675
Trousseau, nervous system in so-called spermatorrhœa, 474
Tuffier, operation for retained testis and hernia, 78; chronic induration of corpora cavernosa, 678, 680; hydrocele in tubercular testis,
Turner (G. R.), abscess of cord, 499
Turner (Samoa), clamp for elephantiasis scroti, 583
Turner (Prof.), mal-development of vas deferens, 26

Ullman, extirpation of tubercular vesiculæ seminales, 606

Vache, rheumatic orchitis, 295
Valette, efficacy of ectopic testis, 46
Vallin, thrombosis of varicocele, 533
Van Buren, abscess of testis, 264, 265; orchitis from cold, 302; castration for masturbation, 476; double penis, 615
Velpeau, absence of seminal apparatus, 25; testis in hæmatocele, 226; puncture of testis, 271; orchitis and typhoid, 284, and small-pox, 287; epididymitis from strain, 299; fœtal inclusions, 430; iodine and atrophy of testis, 448
Verneuil, fluid of hydrocele, 165; cysts of epididymitis, 195; orchitis and tonsillitis, 297; tubercle bacillus in epididymitis, 323; castration and cautery, 366; fœtal inclusions, 430; gummata of cord, 499; cystic disease of scrotum, 569; torsion of penis, 612; herpes, 664; induration of erectile tissue, 680
Vidal, crural ectopia, 38; puncture of testis, 271; orchitis and fevers, 284
Villeneuve, bilocular hydrocele, 172
Virchow, retained testis and malignant disease, 65; enchondroma of testicle, causation, 411
Volkmann, relation of tubercle to injury, 330; cancer of scrotum from tar, paraffin, and soot, 561

Waldeyer, starting-point of sarcoma of testis, 392
Walsham, tubercular testis, 355, 356; myxo-sarcoma of cord, 517
Wardrop, aneurism affecting spermatic arteries, and atrophy of testis, 446
Watson (E.), fibroma of cord, 516
Weber, metastatic sarcoma of penis, 743
Weekes, abscess of testis, 264
Wechselsmann, congenital hydrocele, 163
Weir, carbolic acid injection, 146; sarcoma of erectile tissue of penis, 738
Wells (Sir S.), removal of abdominal retained testis, 71

Widal, microbes in testicles of typhoid patients, 286
Wilks, epididymitis and hereditary syphilis, 313
Wilks (and Moxon), cysts of epididymis, 200; epididymitis and pyæmia, 261
Will, variety of bilocular hydrocele, 114; catgut setons for hydrocele, 161
Wilson, infantile type of penis, 620
Wood, iliac retention of testis, 32; truss, 75; hypertrophy of testis, 444
Wormald, ring for support of varicocele, 536
Wright (G. H.), absence of penis, 610
Wrisberg, frequency of misplaced testis, 29

Zahn, primary sarcoma of vesiculæ seminales, 608; preputial calculi, 647
Zampetti, orchitis in influenza, 289
Zeis, left-sided perineal ectopia and lithotomy, 36
Zeissl, inflammation of vesiculæ seminales, 595; induration of erectile tissue, 681; gummata of penis, 689
Zweigbaum, tuberculosis of os uteri, 324